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(54) **Apparatus and method for sterilization of blister packages and packaging than into cartons**

Vorrichtung und Verfahren zum Sterilisieren und Verpacken von Blisterpackungen in Schachteln

Machine et procédé pour stériliser et emballer en cartons des emballages "blister"

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Description

BACKGROUND OF THE INVENTION

[0001] The present invention relates to an apparatus for the sterilization and secondary packaging into cartons of arrays of blister packages, each of which contains at least one hydrophilic contact lens immersed in a sterile aqueous solution. More specifically, the invention is directed to an apparatus adapted to provide for the assembly of paired arrays of blister packages which are suitably interleaved and transported in batches of predetermined quantities within one or more trays. These trays are transported to a sterilization chamber for sterilizing the exterior surfaces of the arrays of blister packages, particularly the lens-containing interiors thereof, and from which the sterilized arrays of blister packages are then transported to a locale for implementing the secondary packaging thereof into sealable cartons. In addition to the foregoing, the invention is also directed to a method of sterilizing and implementing the secondary packaging into cartons of predetermined quantities of arrays of blister packages, each of which contains a hydrophilic contact lens immersed in a sterile aqueous solution, so as to provide a sterile environment for the arrays of blister packages.

[0002] The packaging of hydrophilic contact lenses in a sterile aqueous solution is well known in the contact lens manufacturing technology. Particularly, packaging arrangements of that type generally consist of so-called blister packages adapted to be employed for the storage and dispensing of the hydrophilic contact lenses for use by a medical practitioner or a consumer who intends to wear the contact lenses. Such hydrophilic contact lenses, which may be disposable after a single period of wear or short-term use, are inexpensively manufactured from suitable hydrophilic polymeric materials; for example, copolymers of hydroxyethylene methacrylate (HEMA) containing from about 20% to 90% or more of water, depending upon the polymer composition. These contact lenses are generally stored immersed in a sterile aqueous solution, ordinarily consisting of an isotonic saline solution, in order to prevent dehydration and to maintain the lenses in a ready-to-wear condition.

[0003] A blister package of the foregoing type normally comprises a base member which is molded from a suitable injection-molded or thermoformed plastic material; for instance a polyolefin, such as polypropylene, and incorporates a cavity adapted to house the contact lens in the aqueous solution. The cavity is sealingly closed by a label-forming cover, preferably in the form of a flexible multi-layered laminated foil or suitable film structure to provide the so-called blister package. This type of packaging arrangement has found widespread use in view of the inherently advantageous storing properties thereof and easy-to-dispense nature of the package by simply peeling the foil from the base member enabling a user to gain ready access to the contact lens which is contained in the cavity of the base member. For example, a blister package which is adapted to provide a sterile sealed storage environment for a disposable, essentially single-use hydrophilic contact lens, which is normally worn for about 8-18 hours within any 24-hour period, wherein the lens is immersed in a sterile aqueous solution within the package is described in U.S. Patent No. 4,691,820 to Martinez; which is assigned to the common assignee of the present application, and the disclosure of which is incorporated herein by reference.

[0004] In the above-mentioned U.S. patent, the blister package for storing and dispensing a hydrophilic contact lens includes an injection-molded or thermoformed plastic base portion or member incorporating a molded cavity which is surrounded by an outstanding planar flange extending about the rim of the cavity. A flexible cover sheet, such as a laminated foil is adhered to the surface of the flange so as to sealingly enclose the cavity in a generally liquid-tight manner. The surface of the covering foil may constitute a label and be imparted suitable printing indicia informative of the product stored in the blister package, the name and address of the manufacturer, and also incorporate various decorative designs and logos as desired; and also provide for changeable information, such as lot numbers, fitting parameters, expiration dates and the like in addition to the foregoing, such as may be required by FDA regulations.

[0005] At this time, a novel and unique concept has been developed through a design for packaging arrangements of the blister package type, particularly for the containment of hydrophilic contact lenses in a sterile aqueous solution, wherein a plurality of base members for such blister packages, each having a cavity for containing a hydrophilic contact lens in the sterile aqueous solution, are adapted to be positioned in a contiguous array and sealing covered by a single or unitary flexible cover sheet, the latter of which is preferably in the form of a multi-layered flexible laminate web having a foil or silicon oxide layer therein. In this instance, the laminated cover sheet is provided with weakening lines, preferably in the form of perforations, extending intermediate each of the respective base members so as to enable individual segments of the foil member to be detached along the weakening lines and in conjunction with the therewith associated base member separated from the remaining array when it is desired to gain access to the contact lens contained in the separated blister package without adversely affecting the integrity of the packaging. This type of arrayed multiple interconnected blister package structure enables the compact packaging of a plurality of such arrays, each possessing a specified number of contact lens-containing base members interconnected by a single flexible cover sheet, within the confines of a suitable sealed container, such as a rigid paperboard carton. In the carton there may be compactly stored a plurality of interleaved pairs

of and superimposed arrays of blister packages wherein; for example, each array consists of five interconnected blister packages with each of the latter having a single disposable contact lens housed therein. The carton may store six superimposed arrays of blister packages, for a total of thirty contact lenses; or in effect, a 30-day supply of contact lenses for respectively one eye of a user, although it is possible to contemplate to provide for cartons storing a 5-, 10-, 15-, 20-, or 25-day supply of contact lenses, or even other quantities. A packaging arrangement for contact lenses of that type which is in the form of arrays of interconnected blister packages is disclosed in applicant's EP-A-0 650 676.

[0006] The blister packages which are formed through the intermediary of this structure comprise a plurality of contiguously arranged injection-molded base members each containing a cavity for housing a hydrophilic contact lens in a sterile aqueous solution, and wherein the resultant array of such base members; for example, five (5) base members, is adapted to be sealingly covered and interconnected by a single multi-layered flexible laminated foil or web which also forms a common label, preferably of the type disclosed in applicant's copending EP-A-0 646 471.

[0007] In the foregoing disclosure, the multi-layered laminated fail includes an outer layer of a plastic film material, such as a polyolefin and preferably polyester, which is adhesively bonded to the surface of a supporting metallic foil, such as aluminum, although a layer of silicon oxide could be utilized instead of the metallic foil, and in which the outer layer is double-sided printed; in effect, on both opposite surfaces. The surface of the outer plastic film layer which faces towards and is adhered to the metallic foil is imprinted with suitable indicia and legends which may consist of permanent information regarding the manufacturer and the product, logos, instructive material, and decorative and advertising indicia relative the product in the blister package; whereas the opposite or exterior surface of the outer plastic film material layer may include suitable changeable information, such as expiration dates, lot numbers, fitting parameters, lens power, and other data specific to the packaged product. The interior surface of the outer plastic film material layer, when desired, may be imprinted through the intermediary of suitable lithographic printing, either in single color or multi-colors and also provided with an appropriate printed background; whereas the changeable information specific to the product which is imprinted on specific areas of the outwardly facing surface of the outer film layer, may be printed thereon through thermal transfer printing, as described in detail in the above-referenced EP-A-0 646 471.

SUMMARY OF THE INVENTION

[0008] In order to accomplish the foregoing sterilization of the arrays of blister packages, particularly of the product or contact lens-containing interiors thereof, and to thereafter implement their secondary packaging into sealable cartons, the inventive apparatus contemplates the utilization of a novel conveyor system in which the foregoing is achieved in an essentially automated mode of operation. Specifically, the apparatus provides for the conveyance of a plurality of trays, each adapted to house therein a specific quantity of interleaved pairs of arrays of blister packages, such as are disclosed in the copending EP-A-0 650 676.

paired interleaved positions, and then conveyed through the intermediary of a transfer conveyor into a respective tray so as to fill spaces in the latter arranged in specified rows and columns. The tray, which is placed into an upended position in order to be able to receive the interleaved pairs of arrays of blister packages from a shuttle conveyor, upon being filled is then tilted back into a normally horizontal orientation and, if desired depending upon production requirements, a plurality of such array-filled trays may then be vertically stacked or superimposed, and also conveyed in a series of such stacked trays. A conveyor is adapted to convey the trays with the arrays of blister packages contained therein into a sterilization chamber, such as an autoclave, in which the arrays of blister packages are collectively sterilized. Subsequent to the sterilization procedure having been completed, the trays together with the sterilized arrays of blister packages are transported by a further conveyor towards an unloading arrangement in which the trays are unstacked and individual trays then sequentially upended. This enables the contents of the trays to be transferred to an unloading shuttle conveyor which, in turn, facilitates specified quantities of interleaved pairs of arrays of blister packages to be advanced in succession into a cartoner having open-ended cartons therein adapted to receive the arrays of blister packages. Thereupon, each of the filled cartons is closed and sealed in the cartoner and transported to further stations for suitable additional handling, such as weighing, labeling and possible assembling for boxing and warehousing, as may be required. The emptied trays are then repositioned or tilted into their horizontal orientations and conveyed in series to a return conveyor so as to be in conditions of readiness for refilling with arrays of blister packages which are to be sterilized, as referred to hereinabove.

[0009] Accordingly, it is an object of the present invention to provide an apparatus for the sterilizing and secondary packaging of specified quantities of arrays of blister packages, with each package containing a contact lens immersed in a sterile aqueous solution.

[0010] A more specific object of the present invention is to provide an apparatus of the type described in which a procedure for filling trays with specified quantities of the arrays of blister packages is implemented in an automated manner, the trays transported to a sterilizing chamber, and thereafter transported to an unloading arrangement for discharging the arrays of blister pack-

ages with their sterilized contents from the trays and effectuating packaging thereof into sealable cartons.

[0011] Still another object of the present invention is to provide an apparatus of the type described in which there are carried out the functions of orienting the arrays of blister packages, positioning the arrays for filling into suitable trays, transporting and stacking the trays prior to conveyance thereof into the sterilizing chamber, transporting the trays with the sterilized arrays of blister packages to an arrangement in which individual of the trays are unstacked, advanced to an unloading station, and the arrays of sterilized blister packages are conveyed to a cartoner for filling cartons with the packages.

[0012] Yet another object of the present invention is to provide a method of sterilizing and secondary packaging into cartons of arrays of blister packages, each containing a contact lens immersed in a sterile aqueous solution through utilizing of the apparatus as described herein.

[0013] A more specific object of the invention is to provide a method for the sterilization and secondary packaging into cartons of a plurality of arrays of blister packages in which the method is implemented through the utilization of automated conveyor and sterilization apparatus in a highly efficient and precise mode of operation.

BRIEF DESCRIPTION OF THE DRAWINGS

[0014] Reference may now be had to a preferred embodiment of the apparatus for sterilization and secondary packaging constructed pursuant to the invention, particularly as directed to the packaging of contact lenses in a sterile environment, taken in conjunction with the accompanying drawings; in which:

Figure 1 is a schematic perspective view of an apparatus for the sterilization and secondary packaging of arrays of interconnected blister packages for the sterilized containment of contact lenses;

Figure 2 is a perspective view of a typical array of interconnected blister packages;

Figure 3 is a side elevational view of a plurality of interleaved paired and superimposed arrays of interconnected blister packages, showing the intended orientation thereof in a carton;

Figure 4 is a perspective view of a partially assembled carton, shown with the end flaps in an opened condition adapted for the receipt of the plurality of arrays of blister packages of Figure 3;

Figure 5 is a perspective view of a carton containing arrays of blister packages, shown with the cover having been opened to enable access by a user to the contents of the carton;

Figure 6 is a flow chart illustrative of the sequence of operation of the apparatus shown in Figure 1;

Figure 7 is a top plan view of the overall layout of the apparatus;

Figure 8 is an elevational view in the direction of line 8-8 in Figure 7;

Figure 9 is a schematic perspective view of a blister package array pick-up and rotating device in a first operative condition thereof;

Figure 10 is a view similar to Figure 9, showing the device in another operative condition;

Figure 11 is an elevational detail view of the device of Figure 9, shown in the direction of line 11-11 in Figure 8;

Figure 12 is a top plan view of the device of Figure 11;

Figure 13 is a side elevational view of the device of Figure 11;

Figure 14 is a schematic perspective view showing the transfer of interleaved paired arrays of blister packages from the pick-up and rotating device into a tray through the intermediary of a tray loading shuttle conveyor arrangement;

Figure 15 is an elevational view of the tray loading shuttle conveyor arrangement, shown in the direction of line 15-15 in Figure 7;

Figure 16 is a top plan view of the tray loading shuttle conveyor arrangement;

Figure 17 is a side elevational view of the tray loading shuttle conveyor arrangement;

Figures 18A through 18D are views of the sequence in the transfer of an interleaved pair of arrays of blister packages from the pick-up and rotating device into tray loading shuttle conveyor arrangement;

Figure 19 is an elevational view of a tray shown in an upended position;

Figure 20 is a fragmentary perspective view of the tray of Figure 19 showing the positioning of interleaved pairs of blister package arrays therein;

Figure 21 is an elevational view of a tray tilting assembly;

Figure 22 is a side elevational view of the tray tilting assembly;

Figure 23 is a top plan view of the tray tilting assembly;

Figure 24 is an elevational view of a tray upstacker assembly as seen in the direction of line 24-24 in Figure 7;

Figure 25 is an elevational view of a tray downstacker assembly as seen in the direction of line 25-25 in Figure 7;

Figure 26 is an elevational view of a tray unloading shuttle assembly;

Figure 27 is a side elevational view of the tray unloading shuttle assembly;

Figure 28 is a top plan view of the tray unloading shuttle assembly;

Figure 29 is an elevational view of a tray unloading conveyor sub-assembly;

Figure 30 is a side elevational view of the tray unloading conveyor sub-assembly;

Figure 31 is a top plan view of the tray unloading conveyor sub-assembly;

Figure 32 is an elevational view of a carton loading arrangement;

Figure 33 is a side elevational view of the carton loading arrangement;

Figure 34 is a top plan view of the carton loading arrangement;

Figure 35 is a perspective schematic view illustrating the loading of a plurality of interleaved pairs of blister packages into a carton;

Figure 36 is an elevational view of a cartoner and carton closing installation as seen on line 36-36 in Figure 34;

Figure 37 is a plan view of a carton blank for forming the carton of Figures 4 and 5;

Figure 38 is a side elevational view of a filled carton stop assembly;

Figure 39 is an end view of the filled carton stop assembly;

Figure 40 is a side view of a rotary carton placement unit as seen along line 40-40 in Figure 7;

Figure 41 is a top plan view of the rotary carton placement unit;

Figure 42 is an end view of the rotary carton placement unit;

Figure 43 is a side elevational view of a carton back-log conveyor assembly as seen along line 43-43 in Figure 7;

Figure 44 is a top plan view of the carton back-log conveyor assembly; and

Figure 45 is a schematic layout of the overall apparatus showing the positioning of various control sensors for regulating the apparatus functions.

DETAILED DESCRIPTION

[0015] Referring now in more specific particularity to the drawings, as shown in Figure 1, there is disclosed a perspective schematic representation of the overall operating structure of an apparatus 10 for implementing the sterilization and secondary packaging into cartons of pluralities of superimposed paired arrays of blister packages utilized for the containment of contact lenses in a sterile environment.

[0016] Figure 1 illustrates the infeed of the blister package arrays 12 along the direction of arrow A so as to be placed in paired interleaved relationship by a product pick-up and rotating device (not shown) as in arrows B, the further conveyance of the interleaved arrays 12 in sequential order so as to be positioned in spaces present between outwardly extending fingers of an endless loop-type tray loading shuttle conveyor assembly 50 which is indexed forwardly in the direction of arrow C until all of the spaces along a vertical run thereof are filled with paired interleaved arrays 12, whereupon the conveyor assembly is adapted to be temporarily brought to a standstill, and a suitable pusher 52 transfers a vertical stack of the arrays 12 from the conveyor into a vertical column or row of array-receiving spaces in an upended tray 100. The tray 100 is intermittently indexed in the direction of arrow D until all of the vertical rows of spaces therein are filled with interleaved pairs of arrays 12 of blister packages.

[0017] As further illustrated in Figure 1, the array-filled tray 100 is shown as being conveyed along the direction of arrow E, while being prior thereto rotated in the direction of arrow F into a horizontal position, and may be stacked with other similarly filled trays 100 in order to be thusly conveyed into a sterilization chamber 150, which may be an autoclave. From the sterilization chamber 150, the stacks of trays 100 with the arrays of blister packages 12 contained therein, with at least the contents such as the contact lenses in the blister packages remaining in a sterile condition, are then conveyed along the direction of the arrow G, and the trays unstacked and individually advanced and upended in succession. The upended tray 100 is positioned in alignment with an unloading shuttle conveyor assembly 250 to enable a pusher member to sequentially engage into vertical rows of spaces of the tray 100 housing the arrays of blister packages and transfer the latter into spaces present between outwardly extending fingers on a loop-type endless conveyor of assembly 250. The conveyor is indexed forwardly in the direction of the arrow H, and a pusher element slides a succession of a plurality of sterilized arrays of blister packages into the open end of a carton which has been brought into alignment therewith by means of a cartoner. The filled cartons are then closed and sealed and conveyed along arrow J to suitable locations for further handling.

[0018] As shown in Figure 2 of the drawings, each array of blister packages 12 consists of five adjacently located base members 14 each possessing a cavity 16 for the containment of a contact lens immersed in a sterile aqueous solution, and with the array 12 being sealingly covered by a single printed label-forming flexible laminated cover sheet 18, so as to be separable along perforation lines into individual blister packages, each respectively containing a single contact lens.

[0019] The base members 14, each of which possesses a flange 20 at one end thereof, are constructed as disclosed in copending EP-A-0 650 676 when positioned in a carton 22 as illustrated in Figure 3 arranged in inverted interleaved pairs of arrays 12, shown in the drawing as consisting essentially of six arrays in this particular instance, filling a carton 22 as shown in Figure 4 in the direction of the arrow H, whereby the end flaps of the carton are adapted to be closed in sequence A-D to form the carton of Figure 5. The latter is illustrated with the opening of the reclosable top flap thereof to enable access to the individual blister packages 12 therein by medical practitioner or user of the contact lenses.

[0020] Referring to Figure 6 of the drawings illustrating a flow chart of the cycle of operation for the apparatus

10 for the sterilization and secondary packaging into cartons of the arrays of blister packages 12, at a first station 30 for the product input this provides for arrays of blister packages 12 in a side-by-side position to be folded and interleaved in a pick-up and rotating device 32, from there through the intermediary of a suitable pusher to be transferred into a position 34 for a shuttle conveyor assembly. The assembly of the conveyor is filled with the interleaved pairs of arrays of blister packages by a pusher as the shuttle conveyor belt is indexed forwardly, and upon being filled with a specified quantity of interleaved pairs of arrays of blister packages, a further pusher, while the conveyor 34 is in a standstill mode, causes a vertical row of interleaved arrays of blister packages to be transferred into a vertical row of spaces in an upended tray position 36 which is positioned aligned adjacent thereto. At that point, upon the tray being indexed and filled, the latter is tilted into a horizontal and advanced to a tray stacking position 38 at which tray stackers are adapted to stack the filled trays and advance these to a sterilization chamber at position 40. Thereafter, the stacked trays are advanced to a tray unstacking station 42, from which individual unstacked trays are forwarded to a station 44 for sequentially removing the sterilized arrays of blister packages from the trays upon upending the trays and causing a pusher to transfer a vertical stack of the paired interleaved arrays of blister packages into an unloading endless loop-type shuttle belt conveyor at position 44. From the latter position 44, a specified number of pairs of arrays of blister packages are advanced into a cartoner at 46 in which open-ended cartons as shown in Figure 4 are successively positioned in alignment therewith so as to be able to fill the cartons with specified numbers of pairs of arrays 12, essentially in a filling condition as shown in Figure 3. The blister package array-filled cartons are then advanced to further stations 48a, 48b and 48c for weighing, labelling, carton finishing and forwarding to a suitable collecting location for boxing and further handling.

[0021] The empty trays 100 are then conveyed to a location proximate the station 36 for inserting the interleaved pairs of arrays of blister packages into the trays and so as to be able to repeat the cycle of operation of the apparatus 10.

[0022] Shown in Figure 7 is the apparatus 10 for implementing the specific cycle of operation. An overall layout in Figures 7 and 8 of the drawings, illustrates respectively top plan and elevational views of the apparatus 10.

[0023] Referring specifically to Figure 7 of the drawings, an arrangement for advancing an empty tray 100 and upending the empty tray at the shuttle conveyor assembly 50 is identified by reference numeral 360.

[0024] A product input station is disclosed herein and identified by reference numeral 70, at which the arrays 12 are placed into position for being subsequently loaded into the upended empty tray 100. A structure for advancing and stacking trays 100 is disclosed and generally identified by reference numeral 80, from which stacked trays 100 which have been previously filled with interleaved pairs of arrays 12 are advanced on a roller conveyor 90 leading to the sterilization chamber 150 which is adapted to receive and sterilize a specified number of stacked and series of blister package array-filled trays 100. A further roller conveyor generally identified by reference numeral 110 leads to a tray unstacker structure 120 from which individual and unstacked trays 100 are advanced to the array unloading shuttle conveyor assembly 250 while previously being upended so as to be positioned in alignment with the unloading shuttle conveyor assembly. The latter is then adapted to receive a stack of paired interleaved arrays of blister packages and indexed upwardly so as to advance predetermined interleaved pairs of arrays into a succession of open-ended cartons as shown in cartoner 200. The filled cartons are then conducted in succession towards the various stations 48a, 48b and 48c as identified in Figure 6, while the emptied trays 100 are again tilted into their initial horizontal positions and hoisted by means of a tray lifting mechanism 170 upwardly onto a roller conveyor 190 for return to the starting location 200, with the empty trays being maintained in series on the roller conveyor 190.

[0025] As shown in Figures 9 through 13 of the drawings, as also in Figure 9, a pair of arrays of blister packages 12 are in side-by-side position placed on a support surface 58 of pick-up and rotating device 32 beneath a vacuum pick-up arrangement 72 consisting of a pair of vacuum conduits 74 each having a plurality of suction elements 76 extending therefrom. Figure 10 illustrates the elements 76 having engaged the cover surfaces 18 on the respective arrays of blister packages 12 and, as shown in Figures 10 and 11, being pivoted in an opposite arcuate mode in the direction of the arrows W so as to position the two arrays of blister packages 12 in a folded or facing interleaved position, essentially as these would ultimately be in when placed in a carton as shown in Figure 3 of the drawings, wherein three of such interleaved arrays 12 are illustrated.

[0026] The station 32 which includes blister package array pick-up and rotating device 70 illustrated herein includes a central element 78 moving in an upward and downward motion so as to impart the arcuate displacement to the vacuum device for interleaving the respective paired arrays of blister packages, and in which a pair of manifolds 73 which are connected to a source of vacuum air (not shown) have suction cups 75 arranged at the lower ends of elements 76.

[0027] As pairs of interleaved arrays of blister packages 12 are placed into the position as shown in Figures 15 through 17, they are adapted to be advanced into a tray loading shuttle conveyor assembly 50 for subsequent loading into a tray 100.

[0028] As schematically illustrated in Figure 14 in which the array pick-up and rotating device 70 is repre-

sented, a pusher element 79 which is described in further detail hereinbelow with respect to Figures 18A through 18D of the drawings, advances the interleaved pair of arrays of blister packages into the interspaces between a series of radially outwardly paddle-shaped extending fingers or support surfaces 64 on an endless loop-type transport conveyor 62, the latter of which is described in more specific detail with regard to Figures 15 through 17 of the drawings.

[0029] As shown in Figure 14, the endless conveyor belt 62 of tray loading shuttle conveyor assembly 50 is adapted to be indexed in the direction of the arrow C shown in Figure 1 so as to enable the pusher element 79 to respectively advance an interleaved pair of blister packages 12 into each interspace between successively radially extending fingers or support elements 74 on the endless belt conveyor 72. The conveyor belt 72, as shown in Figure 17 of the drawings, is adapted to be rotated in the direction of the arrow C through the intermediary of a suitable drive unit and pulley system 66 which will provide for the specified indexing rotational movement of the former in synchronism with the introduction and subsequent discharge of the arrays of blister packages therefrom.

[0030] The upended tray 100 which is positioned in proximity to a vertical run 63 of the loading conveyor belt 62, and which includes vertical rows of spaces 102 of a number analogous to the number of spaces between the fingers 64 on the vertical run of the loading conveyor belt 62, is adapted to be indexed in the direction of the arrow D shown in Figure 1 so as to align in successive order with vertical rows of spaces 102 in the tray 100 the spaces in the vertical run 63 of the loading conveyor belt 62 which has been filled with the interleaved pairs of arrays of blister packages.

[0031] The pusher element 79 for sliding the interleaved pairs of arrays of blister packages into the interspaces between the radially outwardly extending paddle-like finger elements 64 on the loading conveyor belt 62 are illustrated in Figures 18A through 18B of the drawings, whereby successive interleaved pairs of arrays 12 are caused to be advanced in the direction of the arrow A under the urging of the pusher element so as to transfer these interleaved pairs of arrays 12 from the pickup and rotating device 70 into the interspaces between adjacent fingers 64 of the conveyor belt 62, as shown in Figure 14.

[0032] Upon the interspaces along the vertical run 63 of the conveyor belt 62 having been filled with interleaved pairs of arrays of blister packages 12 analogous in number with the vertical row of spaces 102 in the tray 100 which is positioned upended adjacent thereto, a pusher member 52, as also illustrated in Figures 14 and 15, which contains a number of comb-like fingers 52a commensurate in number with the spaces in the vertical run 63 of the endless conveyor belt 62 and the vertical row of spaces 102 in the upended tray 100 is advanced in the direction of the arrow shown in Figure 1 so as to be able to simultaneously fill the vertical row of empty spaces 102 in the tray 100 each with an interleaved pairs of arrays of blister packages 12 by pushing the latter from the conveyor belt 62 into the tray 100.

[0033] The comb-like pusher member 52 is thereafter retracted along the double-headed arrow Y and filling of the vertical run of the loading conveyor again effected by the pusher element 79 sequentially ejecting interleaved arrays from the pick-up and rotating arrangement 70, while the tray 100 is indexed forwardly along the direction of the arrow D to enable filling of successive vertical rows of spaces 102 until the tray is completely filled with arrays 12. As shown in Figures 19 and 20 of the drawings, the spaces 102 in each vertical row of the tray 100 are filled with respectively a pair of interleaved arrays of blister packages, and supported therein as shown in Figure 20 in a mode similar to that in the interleaved pairs of trays will be ultimately packaged in a carton 22.

[0034] Shown in Figures 21 and 23 of the drawings is the installation 360 for upending empty trays 100 prior to positioning thereof at the location adjacent the loading shuttle conveyor assembly 50 for filling the trays 100 with the interleaved pairs of arrays of blister packages 12.

[0035] As shown, particularly in the drawing of Figure 21, a tray 100 which is normally oriented in a horizontal or lay flat condition when in readiness for use thereof while located on the tray returning conveyor 400 of the apparatus 10, is conveyed to a platform 362, which includes a tilting mechanism 364. The mechanism is adapted through the intermediary of gripping arms and beams 366, 368 to tilt the tray 100 into an upright condition as shown by the arrow in Figure 21, so as to have the upright tray align the vertical rows of spaces 102 therein to face the endless conveyor belt 62 as shown in Figures 14 through 17 of the drawings.

[0036] Each tray 100, upon having been fully filled with interleaved pairs of blister package arrays 12, is then adapted to be rotated into its horizontal position by the mechanism 364 of installation 360, as shown in Figure 21, and adapted to be stacked with other similar filled trays, as illustrated in Figures 24 and 25 of the drawings. At the tray stacking location 38, the first tray 100 which has been filled with the blister package arrays is lowered by means of a vertical actuating mechanism 370 until coming to rest on a support 372, and subsequently following filled trays 100 are then moved into position superimposed thereon, as shown in Figure 25. Although Figure 25 illustrates three such filled trays being superimposed in stacked relationship, the apparatus 10 may also be operated with only a single series of trays, or alternatively, two or three trays 100 may be arranged in a stacked relationship. Upon the required number of trays having been stacked, the trays are then conveyed from mechanism 370 on a roller conveyor 380 by being pushed thereon by means of a suitable pusher or driven roller portion, and then in a direction along roller con-

veyor portion 384 including a tray gripping structure 386 into sterilization chamber 150, where the trays may be positioned supported on suitable rollers 152. The sterilization chamber 150, which may be an autoclave, may be designed to hold up to six trays 100 in two stacks of three superimposed trays each.

[0037] A further roller conveyor 390, subsequent to implementing the sterilization of the product, in effect the arrays of blister packages contained in each of the trays, conveys the trays 100 from the sterilization chamber 150 to tray unstacking station 42.

[0038] At the tray downstacking station, a tray downstacker arrangement 400, as illustrated in Figures 25 through 28 of the drawings, maintains the upper trays 100 of each stack in an elevated position while enabling the lowermost tray 100 to be displaced downwardly along supports 402 on a framework 404 of the apparatus 10, and to contact a roller mechanism for conveyance towards a tray unloading shuttle conveyor assembly 440 at station 44. At this location, the trays 100 having been advanced by the downstacker, are individually and sequentially upended so as to face an unloading shuttle conveyor belt arrangement 460 which is constructed somewhat similar to that of the endless conveyor belt 62 of the tray loading shuttle conveyor assembly 50. As illustrated in Figures 29 through 31 of the drawings, the tray unloading assembly 440 includes vertically extending endless loop belt conveyor 462 having radially outwardly extending paddle-like fingers 464, the interspaces of which are adapted to receive interleaved pairs of sterilized arrays of blister packages 12.

[0039] The unloading shuttle conveyor arrangement 440 is operated in a predetermined indexing movement in the direction of the arrow X through the intermediary of a drive unit 470 and belt drive conveyor 472 operatively connected therewith. The upper end of the unloading belt conveyor 462 is entrained over a pair of guide rollers so as to provide for a horizontal flat run 476 for the interleaved pairs of blister package arrays 12.

[0040] As the tray 100 shown in Figure 26 is upended so as to assume a vertical position, subsequent to having been unstacked from the other filled trays, the latter of which are maintained in a position of readiness by the downstacker arrangement 400, the upended tray 100 has a vertical row of its spaces 102 filled with sterilized interleaved pairs of blister package arrays located in alignment with a vertical run of the unloading conveyor belt 462 and a pusher element 466 which has a comb-like finger structure 466a similar to the pusher member 52 described with regard to the loading conveyor assembly 50, pushes a stack or vertical row of interleaved pairs of arrays 12 from the row of spaces 102 in the upended tray 100 into the interspaces between adjacent fingers 464 on the conveyor belt 462.

[0041] As shown in Figures 30 through 34, adjacent the opposite side of the conveyor belt 462 receiving the arrays of blister packages 12 from the tray 100 is a chute 480 leading to a cartoner 488, as shown in Figures 35 and 36, the latter of which may be of indexing wheel construction. As the interleaved pairs of arrays of blister packages are positioned on the upper horizontal run 476 of the unloading conveyor belt 462, a suitable pusher element (not shown) simultaneously pushes a predetermined number of interleaved pairs of blister package arrays 12, in this instance three pairs, into the run of the chute 480 so as to be conveyed into the cartoner in the direction of the arrow H, as also illustrated in Figure 35 of the drawings in schematic representation. The open-ended cartons 22 contained within suitable support apertures 492 in the cartoner 488 have the arrays of blister packages 12 filled therein so as to assume the compact packaging position shown in Figure 3 of the drawings. Upon the cartoner 488 being rotatably indexed, suitable carton end flap folding structure close the end flaps and seal the latter so as to form a sealed carton construction containing sterilized arrays of blister packages.

[0042] As shown in Figure 37, the carton may be prepared from a suitable carton blank having front side and end walls with flap configuration of a construction widely used in the carton producing industry, and wherein the cartons may be folded and glued in a manner well known in the technology.

[0043] As shown in Figures 38 and 39, cartons 22 are conveyed from the cartoner 488 into a suitable off-loading conveyor system 494 so as to be transported past a stop mechanism spacing successive cartons for carton weighing and subsequent labelling procedures, and then their further handling. The displacement and movement of the cartons is illustrated in Figures 40 through 44 showing a belt conveyor whereby the sealed cartons upon egressing from the cartoner 488 are indexed individually forwardly in the direction up to the stop so as to enable individual spaced apart cartons to be weighed and labelled and thereafter assembled as the belt conveyor is indexed forwardly by a belt drive unit for further handling.

[0044] As shown in Figure 45 of the drawings, schematically represented are a plurality of positioning and control sensors which are located along the path of conveyance of the apparatus 10 for sterilizing and secondary packaging into cartons 22 by the arrays of blister packages 12.

[0045] Although the functioning and activation of various of the operative components; in effect, tray tilting, stacking and unstacking sequences, may be implemented through the use of pneumatically-operated devices, it is of course possible to contemplate the employment instead thereof, or in conjunction therewith, of hydraulically-operated, mechanical or electro-mechanical devices.

[0046] Operation of the apparatus 10 in conjunction with the functioning of the sensors of Figure 45 is now described hereinbelow:

[0047] At the discharge end of the return conveyor for the empty trays, the latter of which are lined up in series,

a sensor 517 is adapted to determine the presence of a leading end of a tray 100 and, when required, enable the tray to be advanced to the tray upending position which is sensed by the sensors 516, 158.

[0048] As the apparatus commences operation, position sensors 501 through 503 are adapted to activate the mechanism for upending the empty tray 100 and to move the latter forwardly into position adjacent the loading conveyor arrangement 50, as sensed by sensors 519 and 512.

[0049] Concurrently, at the array input station 30, the sensors 506, 508, 549 will provide for sensing the positioning of the arrays of blister packages on the pick-up and rotating assembly 70, the folding of the arrays of blister packages 12 and the advance thereof by the pusher 52, as sensed by the sensor 511 into the loading conveyor 62. Sensor 510 then, in conjunction with sensor 507, determines the filled condition of the vertical run of the loading belt conveyor 62 and enable activation of the comb-like pusher 79 for advancing a stack of interleaved blister package arrays into a vertical row of spaces 102 in the upended tray 100. The tray may then be indexed so as to enable sequential or successive stacks of interleaved arrays of blister packages to be moved by the comb-like pusher 79 into the successive rows of spaces in the tray 100 until the latter is completely filled.

[0050] Thereafter, upon the final row of spaces having been filled, sensor 520 will enable the tray to be tilted into its initial horizontal position and advanced forwardly to the upstacker where sensors 521 through 524 will control the positions thereof so as to enable further filled trays to be superimposed thereon in a stacked condition. The sensor 514 will then enable the stacked trays to be moved onto the loading conveyor leading to the sterilization chamber 150 or autoclave, and the sensors 515 and 525 will sense the presence of the stacked trays. This will activate the drive for the conveyor towards the sterilization chamber and upon the stacked trays reaching the sensors 526 through 529, for example two the successive stacks of filled trays, a pusher mechanism in the roller conveyor will advance the trays 100 into the sterilization chamber 150.

[0051] The sterilization chamber 150 is normally equipped with vertically slidable, upwardly closable inlet and discharge doors (not shown). During sterilization, both doors are in an upwardly closed position so as to seal the trays within the chamber 150. When the sterilization cycle has been completed, the discharge door is slid downwardly into a chamber-opening position to enable the trays to be conveyed out of the chamber. However, in the event that sensors in the sterilization chamber detect conditions that the desired sterilization has not or only incompletely been effectuated, the discharge door will not open, and a suitable alarm, such as an audio/visual alarm or the like, will give indication of this condition so as to afford servicing personnel to undertake appropriate corrective action, and to enable the operating of the apparatus to again commence.

[0052] Upon proper completion of the sterilizing of the blister package arrays which are stacked in the trays, the discharge conveyor, which includes the tray location and position sensors 531 through 535, permits the trays to be advanced to the downstacker wherein the sensors 544, 545, 546 facilitate unstacking of the trays into individual separated trays which are advanced and upended in alignment with the unloading conveyor 440, activation thereof being implemented through the sensing of the presence of the upended trays and indexing of the unloading conveyor such that a pusher is activated to transfer vertical rows of sterilized blister package arrays into the interspaces between the fingers of the unloading belt conveyor 462, and thereafter facilitating a further pusher to advance predetermined quantities of the interleaved paired blister package arrays into the cartoner 488 for packaging into cartons 22.

[0053] The trays which have been emptied are then serially returned into their horizontal positions and sensed by the sensors 549 through 553 and elevated, as sensed by the sensors 560 and 554 through 559, onto the infeed end of a conveyor for reconveyance towards the other end thereof so as to be ready for reuse for a further batch of trays of blister packages which are to be sterilized and packaged into cartons.

[0054] While there has been shown and described what are considered to be preferred embodiments of the invention, it will be understood by those skilled in the art that the foregoing and other changes in form and details may be made therein without departing from the scope of the invention, as defined by the appended claims.

Claims

1. An apparatus for the sterilization of arrays of interconnected blister packages each containing a contact lens in a sterile environment; comprising:

   (a) a pick-up and rotating arrangement (32) for receiving successive pairs of said arrays (12) and orienting each of said pairs into predetermined relationship with each other;

   (b) a shuttle conveyor assembly (34) including support structure for a plurality of said oriented pairs of arrays (12); a transfer element operatively associated with said pick-up and rotating arrangement (32) and said shuttle conveyor assembly (34) for sequentially transferring said plurality of oriented pairs of arrays (12) from said pick-up and rotating arrangement (32) to said support structure on said conveyor shuttle assembly (34);

   (c) at least one tray (100) having a series of adjacently located rows of array-receiving spaces (102) for housing one said pair of arrays (12) in respectively each said space,

said at least one tray (100) being movable into position proximate said shuttle conveyor assembly (34);

(d) a pusher structure (52) operatively associated with said shuttle conveyor assembly (34) for transferring a predetermined quantity of said arrays (12) from said support structure into the spaces in said at least one tray (100);

(e) a sterilization chamber (150) for receiving said at least one tray (100); and a transport installation for conveying said at least one array-filled tray (100) into said sterilization chamber (150) for the sterilization of the arrays of blister packages (12) housed in said at least one tray (100) in said chamber (150).

2. An apparatus as claimed in Claim 1, wherein said pick-up and rotating arrangement (32) comprises a vacuum unit including means (75) for engaging a pair of said arrays (12); and operating structure for pivoting said pair of arrays (12) into a mutually interleaved orientation.

3. An apparatus as claimed in Claim 2, wherein said array engaging means comprises pneumatically-actuated arm members (76) of a manifold (74) connected to said vacuum unit for pivoting said pair of arrays (12) into said interleaved orientation.

4. An apparatus as claimed in Claim 2, wherein said vacuum unit includes suctioning means for grippingly contacting said pair of arrays (12) during the pivoting thereof into the interleaved position for said arrays (12).

5. An apparatus as claimed in Claim 1, wherein said transfer element comprises a pusher member (79) for slidingly advancing pairs of arrays (12) into successive spaces formed between each of a plurality radially outwardly extending fingers (64) on said array support structure of the shuttle conveyor assembly (50).

6. An apparatus as claimed in Claim 5, wherein drive means (66) impart indexing advancing movements to an endless belt conveyor (62) of said conveyor assembly (50), said support structure comprising a plurality of said fingers (64) spaced about the peripheral extent of said loop conveyor (62), said pusher element (79) sequentially advancing oriented pairs of said arrays (12) from said pick-up and rotating arrangement (32) so as to position one pair of said arrays (12) in each respective space between adjacent fingers (64) on said endless belt conveyor (62).

7. An apparatus as claimed in Claim 6, wherein a slide guide mounts said pusher element for reciprocatory movement relative to said pick-up and rotating arrangement transversely of the direction of the indexing advance of said endless belt conveyor (62).

8. An apparatus as claimed in Claim 6, wherein said endless belt conveyor (62) has a vertical run, said pairs of arrays (12) being filled into the spaces between the fingers (64) along the extent of said vertical run, said at least one tray (100) having a plurality of said rows of spaces (102) arranged adjacent each other, each said row of spaces being successively positionable in alignment with the spaces containing said arrays (12) between the fingers (64) along the vertical run of said endless belt conveyor (62), said pusher structure (52) having a plurality of comb-shaped protrusions commensurate with the number of spaces between the fingers (64) on said vertical run of said endless conveyor belt (62) advanceable into the spaces between said fingers (64), and actuating means for advancing said pusher structure into said endless belt conveyor (62) so as to concurrently transfer the arrays (12) contained in the spaces between said fingers (64) into the therewith aligned row of spaces in said at least one tray (100).

9. An apparatus as claimed in Claim 8, wherein actuating means index said at least one tray (100) to successively align vertical rows of spaces (102) therein with the vertical run of said endless conveyor belt (62) upon filling of a preceding row of said spaces in said at least one tray (100) for filling said rows of spaces (102) in said tray (100) with paired arrays of blister packages (12).

10. An apparatus as claimed in Claim 8, wherein said at least one tray (100) is normally maintained in a lay-flat horizontal condition during conveyance thereof through said apparatus.

11. An apparatus as claimed in Claim 10, wherein pivoting means (360) tilts said at least one (100) tray into an upended position at said shuttle conveyor assembly (50) to successively align vertically extending rows of spaces (102) in said at least one tray (100) with the spaces between the fingers (64) along the vertical run of said endless conveyor belt (62) to facilitate the transfer of said pairs of arrays (12) from said endless conveyor belt (62) for filling said at least one tray (100).

12. An apparatus as claimed in Claim 11, wherein said pivoting means (360) tilts said at least one tray (100) into the normal horizontal position thereof subsequent to filling the rows of spaces (102) in said at least one tray (100) with said paired arrays (12).

13. An apparatus as claimed in Claim 1, wherein said transport installation includes an upstacking mechanism (370) along the path of conveyance (E) of said at least one tray (100) between said shuttle conveyor assembly (50) and said sterilization chamber (150) so as to stack at least two of said array-filled trays (100) in vertical superposition.

14. An apparatus as claimed in Claim 13, wherein said transport installation comprises roller tracks (380) for conveying said at least two stacked trays (100) from said upstacking mechanism (370) into said sterilization chamber (150).

15. An apparatus as claimed in Claim 14, wherein said roller tracks (380) include drive means for imparting rotation to at least portions of the roller tracks (380) for advancing said trays (100) from said shuttle conveyor assembly (50) into said sterilization chamber (150).

16. An apparatus as claimed in Claim 15, wherein said transport installation comprises further roller tracks (390) extending from a discharge outlet for said trays (100) from said sterilization chamber (150), said further roller track (390) communicating with a tray unloading shuttle conveyor (440) for transferring the arrays (12) contained in said tray (100) towards a cartoner (488).

17. An apparatus as claimed in Claim 1, wherein said sterilization chamber (150) comprises an autoclave.

18. An apparatus according to any preceding claim, further comprising a secondary packaging apparatus (488) for packaging the arrays (12) into cartons (22) the secondary packaging apparatus (488) comprising:

(a) transport means (390) for conveying said at least one tray (100) from the sterilization chamber (150) in which said arrays (12) are collectively sterilized;

(b) a shuttle conveyor assembly (440) for receiving said arrays (12) from said at least one tray (100); said shuttle conveyor assembly (440) including an endless conveyor belt (462) having a plurality of spaced outwardly extending fingers (464) along the peripheral extent thereof, said transport means (390) conveying said at least one tray (100) to said shuttle conveyor assembly (440);

(c) pivoting means (460) for tilting said at least one tray into an upended position at said shuttle conveyor assembly (440) to successively align vertically oriented rows of spaces (102) in said at least one tray (100) with the spaces between the fingers (464) along a vertical run of said endless conveyor belt;

(d) a pusher structure (466) including a plurality of spaced protrusions being extendable into the spaces (102) of said at least one tray (100) for transferring the arrays (12) in each row of spaces (102) into aligned spaces between the fingers (464) on the vertical run of said endless conveyor belt (462);

(e) a cartoner (488) including positioning means (480) for successively aligning open-ended cartons (22) with an upper horizontal run of said endless conveyor belt (462); and

(f) a sliding pusher mounted for reciprocation proximate said upper run or the endless belt conveyor (462) for transferring successive predetermined numbers of arrays (12) from said upper horizontal run of the endless conveyor belt (462) into a respective carton (22) in said cartoner (488).

19. An apparatus as claimed in Claim 18, wherein chute means (480) interconnect the upper horizontal run of said endless belt conveyor (462) with said cartoner (488), said sliding pusher sliding successive of said arrays (12) along said chute means (480) into carton (22) aligned by said cartoner (488) with a discharge end of said chute means (480).

20. An apparatus as claimed in Claim 18, wherein said cartoner (488) comprises a rotatably indexed wheel structure, said open-ended cartons (22) being insertable into through-apertures in said wheel structure; and drive means for rotating said wheel structure in synchronism with the insertion of arrays (12) into said cartons (22) by said sliding pusher.

21. An apparatus as claimed in Claim 20, wherein said wheel structure includes elements for closing end flaps on said cartons (22) subsequent to filling of said cartons (22) with said arrays (12) and for sealing said closed cartons (22).

22. An apparatus as claimed in Claim 21, wherein conveyor means (494) communicate with said cartoner (488) for sequentially transporting array-filled cartons (22) from said wheel structure to carton weighing and labeling stations and for collecting said cartons (22) for further handling.

23. An apparatus as claimed in Claim 18, wherein said transport means (390) conveys a plurality of stacked of said trays (100) from said sterilization chamber (150) towards said shuttle conveyor assembly (440); and a tray downstacking mechanism (400) for separating said stacked trays (100) and forwarding individual of said trays (100) towards said shuttle conveyor assembly (440) in

predetermined spaced advance.

24. An apparatus as claimed in Claim 23, wherein pivoting means tilts said unstacked trays in sequence into an upended position to facilitate transfer of the arrays (12) housed therein into the vertical run of said endless belt conveyor (462) by said pusher structure (466).

25. An apparatus as claimed in Claim 24, wherein said pivoting means returns said tray (100) into a horizontal position subsequent to completion of the indexed transfer of the arrays (12) therefrom to said endless belt conveyor (462).

26. An apparatus as claimed in Claim 18, wherein said transport means (390) comprises a roller track arrangement having at least portions rotatably driven for conveyance of said at least one tray (100).

27. An apparatus as claimed in Claim 26, wherein said roller track arrangement includes a track segment (190) for returning emptied trays (100) to an initial starting locating (200) for filling said trays (100) with paired arrays of blister packages (12).

28. An apparatus as claimed in any preceding Claim, wherein a plurality of sensors are positioned along the path of advance of said at least one tray (100) through said apparatus for controlling the functions of the operative components of said apparatus.

29. A method for the sterilization of arrays (12) of interconnected blister packages each containing a contact lens in a sterile environment; comprising:

(a) actuating a pick-up and rotating arrangement (32) for receiving successive pairs of said arrays (12) and orienting each of said pairs into predetermined relationship with each other;
(b) actuating a shuttle conveyor assembly (34) including support structure for a plurality of said oriented pairs of arrays (12) through a transfer element operatively associated in synchronism with said pick-up and rotating arrangement (32) and said shuttle conveyor assembly (34) for sequentially transferring said plurality of oriented pairs of arrays (12) from said pick-up and rotating arrangement (32) to said support structure on said conveyor shuttle assembly (34);
(c) moving at least one tray (100) having a series of adjacently located rows of array-receiving spaces (102) for housing one said pair of arrays (12) in respectively each said space (102) into position proximate said shuttle conveyor assembly (34);
(d) displacing a pusher structure (52) operatively associated with said shuttle conveyor assembly (34) for transferring a predetermined quantity of said arrays (12) from said support structure into the spaces (102) in said at least one tray (100); and
(e) conveying said at least one array-filled tray (100) into a sterilization chamber (150) for the collective sterilization of the arrays of blister packages (12) housed in said at least one tray (100) in said chamber (150).

30. A method as claimed in Claim 29, wherein said pick-up and rotating arrangement (32) comprises a vacuum unit operated for engaging a pair of said arrays (12); and pivoting said pair of arrays (12) into a mutually interleaved orientation.

31. A method as claimed in Claim 30, wherein said arrays are engaged by pneumatically-actuated arm members (76) of a manifold (74) connected to said vacuum unit for pivoting said pair of arrays (12) into said interleaved orientation.

32. A method as claimed in Claim 30, wherein said vacuum unit includes suctioning means (75) grippingly contacting said pair of array (12) during the pivoting thereof into the interleaved orientation.

33. A method as claimed in Claim 29, wherein said transfer element comprises a pusher member (79) slidingly advancing pairs of arrays (12) into successive spaces formed between each of a plurality radially outwardly extending fingers (64) on said array support structure of the shuttle conveyor assembly (34).

34. A method as claimed in Claim 33, wherein drive means (66) impart indexing advancing movements to an endless belt conveyor (62) of said conveyor assembly (50), said support structure comprising a plurality of said fingers (64) spaced about the peripheral extent of said loop conveyor (62), said pusher element (79) sequentially advancing oriented pairs of said arrays (12) from said pick-up and rotating arrangement (32) so as to position one pair of said arrays (12) in each respective space between adjacent fingers (64) on said endless belt conveyor (62).

35. A method as claimed in Claim 34, wherein a slide guide reciprocates said pusher element relative to said pick-up and rotating arrangement (32) transversely of the direction of the indexing advance of said endless belt conveyor (62).

36. A method as claimed in Claim 34, wherein said endless belt conveyor (62) has a vertical run, said

pairs of arrays (12) being filled into the spaces between the fingers (64) along the extent of said vertical run, said at least one tray (100) having a plurality of said rows of spaces (102) arranged adjacent each other, each said row of spaces (102) being successively positionable in alignment with the spaces containing said arrays (12) between the fingers (64) along the vertical run of said endless belt conveyor (62), said pusher structure (52) having a plurality of comb-shaped protrusions commensurate with the number of spaces between the fingers (64) on said vertical run of said endless conveyor belt (62) advanceable into the spaces between said fingers (64), and advancing said pusher structure (52) into said endless belt conveyor (62) so as to concurrently transfer the arrays (12) contained in the spaces between said fingers (64) into the therewith aligned row of spaces (102) in said at least one tray (100).

37. A method as claimed in Claim 36, wherein said at least one tray (100) is indexed to successively align vertical rows of spaces (102) therein with the vertical run of said endless conveyor belt (62) upon filling of a preceding row of said spaces (102) in said at least one tray (100) for filling said rows of spaces (102) in said tray (100) with paired arrays of blister packages (12).

38. A method as claimed in Claim 36, wherein said at least one tray (100) is normally maintained in a lay-flat horizontal condition during conveyance thereof through said apparatus.

39. A method as claimed in Claim 38, wherein said at least one tray (100) is tilted into an upended position at said shuttle conveyor assembly (34) to successively align vertically extending rows of spaces (102) in said at least one tray (100) with the spaces between the fingers (64) along the vertical run of said endless conveyor belt (62) to facilitate the transfer of said pairs of arrays (12) from said endless conveyor belt (62) for filling said at least one tray (100).

40. A method as claimed in Claim 39, wherein said at least one tray (100) is tilted into a normal horizontal position thereof subsequent to filling the rows of spaces (102) in said at least one tray (100) with said paired arrays (12).

41. A method as claimed in Claim 29, wherein said transport installation includes an upstacking mechanism (370) along the path of conveyance (E) of said at least one tray (100) between said shuttle conveyor assembly (50) and said sterilization chamber (150) for stacking at least two of said array-filled trays (100) in vertical superposition.

42. A method as claimed in Claim 41, wherein said transport installation comprises roller tracks (380) for conveying said at least two stacked trays (100) from said upstacking mechanism (370) into said sterilization chamber (150).

43. A method as claimed in Claim 42, wherein rotation is imparted to at least portions of the roller tracks (380) for advancing said trays (100) from said shuttle conveyor assembly (50) into said sterilization chamber (150).

44. A method as claimed in Claim 43, wherein said transport installation comprises further roller tracks (390) extending from a discharge outlet for said trays (100) from said sterilization chamber (150), said further roller track (390) communicating with a tray unloading shuttle conveyor (440) for transferring the arrays (12) contained in said tray (100) towards a cartoner (488).

45. A method as claimed in Claim 29, wherein said sterilization chamber (150) comprises an autoclave.

46. A method according to any of claims 29 to 45, further comprising steps for the secondary packaging into cartons (22) of arrays (12) of interconnected blister packages each containing a contact lens in a sterile environment, the further steps comprising:

(a) conveying said at least one tray (100) from the sterilization chamber (150) in which said arrays (12) are collectively sterilized;
(b) actuating a shuttle conveyor assembly (250) for receiving said arrays (12) from said at least one tray (100); said shuttle conveyor assembly (250) including an endless conveyor belt (462) having a plurality of spaced outwardly extending fingers (464) along the peripheral extent thereof, and conveying said at least one tray (100) to said shuttle conveyor assembly (250);
(c) tilting said at least one tray (100) into an upended position at said shuttle conveyor assembly (250) to successively align vertically oriented rows of spaces (102) in said at least one tray (100) with the spaces between the fingers (464) along a vertical run of said endless conveyor belt (462);
(d) extending a pusher structure (466) including a plurality of spaced protrusions (466a) into the spaces (102) of said at least one tray (100) for transferring the arrays (12) in each row of spaces (102) into aligned spaces between the fingers (464) on the vertical run of said endless conveyor belt (462);
(e) successively aligning open-ended cartons (22) with an upper horizontal run of said end-

less conveyor belt (462); and

(f) reciprocating a sliding pusher said upper run of the endless belt conveyor (462) for transferring successive predetermined numbers of arrays (12) from said upper horizontal run of the endless conveyor belt (462) into a respective one of said cartons (22).

47. A method as claimed in Claim 46, wherein the upper horizontal run of said endless belt conveyor (462) communicates with said cartons (22), and sliding successive of said arrays (12) along into respective cartons (22) successively aligned therewith.

48. A method as claimed in Claim 46, wherein a cartoner (488) comprising a rotatably indexed wheel structure has said open-ended cartons (22) inserted into through-apertures in a cartoner wheel structure; and rotating said wheel structure in synchronism with the successive insertion of arrays (12) into said cartons (22).

49. A method as claimed in Claim 48, wherein said wheel structure includes elements for closing end flaps on said cartons (22) subsequent to filling of said cartons (22) with said arrays (12) and for sealing said closed cartons (22).

50. A method as claimed in Claim 49, wherein array-filled cartons (22) are sequentially conveyed from said wheel structure to carton weighing and labeling stations and for collecting said cartons for further handling.

51. A method as claimed in Claim 46, wherein a plurality of stacked of said trays (100) are conveyed from said sterilization chamber (150) towards said shuttle conveyor assembly (250); and a tray downstacking mechanism (400) separates said stacked trays (100) and forwards individual of said trays (100) towards said shuttle conveyor assembly (250) in predetermined spaced advance.

52. A method as claimed in Claim 51, wherein said unstacked trays (100) are tilted in sequence into an upended position to facilitate transfer of the arrays (12) housed therein into the vertical run of said endless belt conveyor (462).

53. A method as claimed in Claim 52, wherein said trays (100) are tilted into a normally horizontal position subsequent to completion of the indexed transfer of the arrays (12) therefrom to said endless belt conveyor (462).

54. A method as claimed in Claim 46, wherein a roller track arrangement (390) has at least portions thereof rotatably driven for conveyance of said at least one tray (100).

55. A method as claimed in Claim 54, wherein emptied trays (100) are conveyed to an initial starting locating (200) for filling said trays (100) with paired arrays of blister packages (12).

56. A method as claimed in any of claims 29 to 55, wherein chute mean (480) interconnect the upper horizontal run of said endless belt conveyor (462) with a cartoner (488), for sliding successive of said arrays (12) along said chute means (480) into open-ended cartons (22) aligned by said cartoner (488) with a discharge end of said chute means (480).

57. A method as claimed in any of claims 29 to 56, wherein a plurality of sensors positioned along the path of advance of said at least one tray control the functions of the operative components of an apparatus for implementing the method.

Patentansprüche

1. Vorrichtung zur Sterilisation von Anordnungen untereinander verbundener Blisterverpackungen, deren jede eine Kontaktlinse in einer sterilen Umgebung enthält, umfassend:

a) eine Aufnahme- und Drehanordnung (32) zur Aufnahme aufeinanderfolgender Paare der Anordnungen (12) und zum Ausrichten jedes der Paare in einer vorgegebenen Lage zueinander;

b) eine Pendelverkehrs-Förderbaugruppe (34) mit einem Träger für eine Vielzahl der ausgerichteten Paare von Anordnungen (12) und ein Überführungselement, welches mit der Aufnahme- und Drehanordnung (32) und der Pendelverkehrs-Förderbaugruppe funktionell zusammenwirkt, um die Vielzahl ausgerichteter Paare von Anordnungen (12) nacheinander von der Aufnahme- und Drehanordnung (32) zum Träger auf der Pendelverkehrs-Förderbaugruppe (34) zu überführen;

c) mindestens ein Tablett (100) mit einer Anzahl benachbarter Reihen von Anordnungs-Aufnahmeräumen (102) zur Aufnahme jeweils eines Paares von Anordnungen (12) in jedem Aufnahmeraum, wobei das mindestens eine Tablett (100) in eine Position in der Nähe der Pendelverkehrs-Förderbaugruppe (34) bewegbar ist;

d) eine Stößelanordnung (52), die funktions-

mäßig mit der Pendelverkehrs-Förderbaugruppe (34) verbunden ist, um eine vorgegebene Menge der Anordnungen (12) von dem Träger in Aufnahmeräume in dem mindestens einen Tablett (100) zu überführen;

e) eine Sterilisationskammer (150) zur Aufnahme mindestens eines Tabletts (100) sowie ein Transportsystem zum Fördern des mindestens einen mit Anordnungen gefüllten Tabletts (100) in die Sterilisationskammer (150) zur Sterilisation der Anordnungen der auf dem mindestens einen Tablett (100) gelagerten Blisterverpackungen (12) in der Kammer (150).

2. Vorrichtung nach Anspruch 1, bei welcher die Aufnahme- und Drehanordnung (32) eine Vakuumeinheit umfaßt, welche eine Einrichtung (75) zum Erfassen eines Paares von Anordnungen (12) sowie eine Betätigungsanordnung zum Schwenken des Paares von Anordnungen (12) in eine Ausrichtung mit Abstand voneinander aufweist.

3. Vorrichtung nach Anspruch 2, bei welcher die Einrichtung zum Erfassen der Anordnungen pneumatisch betätigte Armelemente (76) eines an die Vakuumeinheit angeschlossenen Rohrverteilers (74) umfaßt, um das Paar von Anordnungen (12) in die Ausrichtung mit Abstand voneinander zu schwenken.

4. Vorrichtung nach Anspruch 2, bei welcher die Vakuumeinheit Saugeinrichtungen (75) aufweist, um sich an das Paar von Anordnungen (12) während des Schwenkens in die Position der Anordnungen (12) mit Abstand voneinander greifend anzulegen.

5. Vorrichtung nach Anspruch 1, bei welcher das Überführungselement ein Stößelelement (79) aufweist, um ein Paar der Anordnungen (12) gleitend in aufeinander folgende Räume vorzuschieben, welche zwischen einer Vielzahl sich radial nach außen erstreckender Finger (64) auf dem Anordnungsträger der Pendelverkehrs-Förderbaugruppe (50) ausgebildet sind.

6. Vorrichtung nach Anspruch 5, bei welcher eine Antriebseinrichtung (66) eine Endlosband-Fördereinrichtung (62) der Förderbaugruppe (50) in schrittweise Vorschubbewegungen versetzt, wobei der Träger eine Vielzahl im Abstand voneinander auf dem Umfang der Bandfördereinrichtung (62) angeordnete Finger (64) aufweist und das Stößelelement (79) nacheinander ausgerichtete Paare von Anordnungen (12) von der Aufnahme- und Drehanordnung (32) vorschiebt, um jeweils ein Paar dieser Anordnungen (12) im jeweiligen Zwischenraum zwischen benachbarten Fingern (64) der Endlosband-Fördereinrichtung (62) zu positionieren.

7. Vorrichtung nach Anspruch 6, bei welcher eine Gleitführung das Stößelelement für eine Hin- und Herbewegung in bezug auf die Aufnahme- und Drehanordnung quer zur Richtung des Schrittvorschubes der Endlosband-Fördereinrichtung (62) aufnimmt.

8. Vorrichtung nach Anspruch 6, bei welcher die Endlosband-Fördereinrichtung (62) einen vertikalen Strang hat, wobei die Paare von Anordnungen (12) entlang der Ausdehnung des vertikalen Stranges in die Zwischenräume zwischen den Fingern (64) eingelegt werden, das mindestens eine Tablett (100) eine Vielzahl von Reihen nebeneinander angeordneter Aufnahmeräume hat, jede der Reihen von Aufnahmeräumen nacheinander zu den Abständen ausrichtbar ist, welche die Anordnungen (12) zwischen den Fingern (64) entlang des vertikalen Stranges der Endlosband-Fördereinrichtung (62) enthalten, die Stößelanordnung (52) eine Vielzahl kammförmiger Vorsprünge aufweist, welche mit der Anzahl der Zwischenräume zwischen den Fingern (64) am vertikalen Strang der Endlosband-Fördereinrichtung (62) übereinstimmend in die Zwischenräume zwischen den Fingern (64) ausfahrbar ist und eine Betätigungseinrichtung für den Vorschub der Stößelanordnung zur Endlosband-Fördereinrichtung (62) hin vorhanden ist, um die in den Zwischenräumen zwischen den Fingern (64) befindlichen Anordnungen (12) zusammen in die dazu ausgerichteten Reihen von Aufnahmeräumen auf dem mindestens einen Tablett (100) zu überführen.

9. Vorrichtung nach Anspruch 8, bei welcher die Betätigungseinrichtung das mindestens eine Tablett (100) schrittweise weiterschaltet, um nacheinander die vertikalen Reihen der darin befindlichen Aufnahmeräume (102) jeweils nach dem Füllen der vorhergehenden Reihe solcher Aufnahmeräume (102) zu dem vertikalen Strang der Endlosband-Fördereinrichtung (62) auszurichten, um die Reihen von Aufnahmeräumen (102) in diesem Tablett (100) mit paarweisen Anordnungen (12) von Blisterverpackungen zu füllen.

10. Vorrichtung nach Anspruch 8, bei welcher das mindestens eine Tablett (100) während der Förderung durch die Vorrichtung hindurch normalerweise in einer horizontalen ebenen Lage gehalten wird.

11. Vorrichtung nach Anspruch 10, bei welcher eine Schwenkeinrichtung (360) das mindestens eine Tablett (100) an der Pendelverkehrs-Förderbaugruppe (50) in eine aufrechte Position schwenkt,

um die sich vertikal erstreckenden Reihen von Aufnahmeräumen (102) in dem mindestens einen Tablett (100) nacheinander zu den Zwischenräumen zwischen den Fingern (64) entlang des vertikalen Stranges der Endlosband-Fördereinrichtung (62) auszurichten und so die Überführung der Paare von Anordnungen (12) von der Endlosband-Fördereinrichtung (62) zum Füllen des mindestens einen Tabletts (100) zu ermöglichen.

12. Vorrichtung nach Anspruch 11, bei welcher die Schwenkeinrichtung (360) das mindestens eine Tablett (100) nach dem Füllen der Reihen von Aufnahmeräumen (102) in diesem mindestens einem Tablett (100) mit den Paaren von Anordnungen (12) in seine normale horizontale Position schwenkt.

13. Vorrichtung nach Anspruch 1, bei welcher das Transportsystem entlang der Förderbahn (E) des mindestens einen Tabletts (100) zwischen der Pendelverkehrs-Förderbaugruppe (50) und der Sterilisationskammer (150) einen Stapelmechanismus (370) aufweist, um mindestens zwei der mit Anordnungen gefüllten Tabletts (100) vertikal übereinander zu stapeln.

14. Vorrichtung nach Anspruch 13, bei welcher das Transportsystem Rollenbahnen (380) zum Befördern der mindestens zwei gestapelten Tabletts (100) vom Stapelmechanismus (370) in die Sterilisationskammer (150) aufweist.

15. Vorrichtung nach Anspruch 14, bei welcher die Rollenbahnen (380) Antriebseinrichtungen aufweisen, um zumindest Teile der Rollenbahnen (380) in Umdrehungen zu versetzen und dadurch die Tabletts (100) von der Pendelverkehrs-Förderbaugruppe (50) in die Sterilisationskammer (150) vorwärts zu bewegen.

16. Vorrichtung nach Anspruch 15, bei welcher das Transportsystem weitere Rollenbahnen (390) aufweist, die sich vom Auslaß der Tabletts (100) aus der Sterilisationskammer (150) aus erstrecken, wobei die weiteren Rollenbahnen (390) mit einer Tablett-Entlade-Pendelverkehrs-Fördereinrichtung (440) in Verbindung stehen, um die in dem Tablett (100) enthaltenen Anordnungen (12) zu einer Karton-Verpackungseinrichtung (488) zu überführen.

17. Vorrichtung nach Anspruch 1, bei welcher die Sterilisationskammer (150) aus einem Autoklaven besteht.

18. Vorrichtung nach einem der bisherigen Ansprüche, welche weiterhin eine zweite Verpackungsvorrichtung (488) zum Verpacken der Anordnungen (12) in Kartons (22) aufweist, wobei die zweite Verpackungsvorrichtung (488) umfaßt:

a) eine Transporteinrichtung (390) zum Befördern des mindestens einen Tabletts (100) von der Sterilisationskammer (150) weg, in welcher die Anordnungen (12) gemeinsam sterilisiert werden;

b) eine Pendelverkehrs-Förderbaugruppe (440) zur Aufnahme der Anordnungen (12) von dem mindestens einem Tablett (100), wobei diese Pendelverkehrs-Förderbaugruppe (440) ein Endlos-Förderband (462) mit einer Vielzahl im Abstand voneinander angeordneter, nach außen gerichteter Finger (464) an seinem Außenumfang aufweist und die Fördereinrichtung (390) das mindestens eine Tablett (100) zu der Pendelverkehrs-Förderbaugruppe (440) befördert;

c) eine Schwenkeinrichtung (460) zum Kippen des mindestens einen Tabletts an der Pendelverkehrs-Förderbaugruppe (440) in eine aufrechte Position, um die senkrecht angeordneten Reihen von Aufnahmeräumen (102) in dem mindestens einem Tablett (100) zu den Zwischenräumen zwischen den Fingern (464) entlang des vertikalen Stranges des Endlosband-Förderbandes auszurichten;

d) eine Stößelanordnung (466) mit einer Vielzahl im Abstand voneinander angeordneter Vorsprünge, welche in die Aufnahmeräume (102) des mindestens einen Tabletts (100) ausfahrbar sind, um die Anordnungen (12) in jeder Reihe von Aufnahmeräumen (102) in die ausgerichteten Zwischenräume zwischen den Fingern (464) am vertikalen Strang des Endlos-Förderbandes (462) zu überführen;

e) eine Karton-Verpackungseinrichtung (488) mit einer Positionierungseinrichtung (480) zum aufeinanderfolgenden Ausrichten von Kartons (22) mit offenem Ende zu einem oberen, horizontalen Strang des Endlos-Förderbandes (462) und

f) einen Gleitstößel, welcher angebracht ist, um sich in einer Hin- und Herbewegung an den oberen Strang des Endlos-Förderbandes (462) anzunähern, um nacheinander vorgegebene Anzahlen von Anordnungen (12) von dem oberen horizontalen Strang des Endlos-Förderbandes (462) in den jeweiligen Karton (22) in der Karton-Verpackungseinrichtung (488) zu überführen.

19. Vorrichtung nach Anspruch 18, bei welcher eine

Rutscheinrichtung (480) den oberen horizontalen Strang der Endlosband-Fördereinrichtung (462) mit der Karton-Verpackungseinrichtung (488) verbindet, wobei der Gleitstößel die Anordnungen (12) nacheinander entlang der Rutscheinrichtung (480) in den durch die Karton-Verpackungseinrichtung (488) zum Entlade-Ende der Rutscheinrichtung (480) ausgerichteten Karton (21) gleiten läßt.

20. Vorrichtung nach Anspruch 18, bei welcher die Karton-Verpackungseinrichtung (488) eine Rundschaltanordnung, in deren durchgehende Öffnungen Kartons (22) mit offenem Ende einsetzbar sind sowie eine Antriebseinrichtung zum Drehen der Rundschaltanordnung synchron zum Einsetzen der Anordnungen (12) mittels des Gleitstößels in die Kartons (22) umfaßt.

21. Vorrichtung nach Anspruch 20, bei welcher die Rundschaltanordnung Elemente zum Schließen der End-Klappdeckel der Kartons (22) im Anschluß an das Füllen der Kartons (22) mit den Anordnungen (12) sowie zum dichten Verschließen der geschlossenen Kartons (22) aufweist.

22. Vorrichtung nach Anspruch 21, bei welcher die Fördereinrichtung (494) mit der Karton-Verpackungseinrichtung (488) in Verbindung steht, um die mit den Anordnungen gefüllten Kartons (22) nacheinander von der Rundschalteinrichtung zu Karton-Wiege- und -Etikettierungs-Stationen sowie zum Sammeln der Kartons (22) zur weiteren Handhabung zu transportieren.

23. Vorrichtung nach Anspruch 18, bei welcher die Transporteinrichtung (390) eine Vielzahl gestapelter Tabletts (100) von der Sterilisationskammer (150) zur Pendelverkehrs-Förderbaugruppe (440) transportiert und ein Tablett-Entstapel-Mechanismus (400) zum Trennen der gestapelten Tabletts (100) sowie zum Vorwärtsbewegen einzelner Tabletts (100) in vorgegebenen Vorschubabständen zur Pendelverkehrs-Förderbaugruppe (440) vorgesehen ist.

24. Vorrichtung nach Anspruch 23, bei welcher eine Schwenkeinrichtung die entstapelten Tabletts (100) nacheinander in eine aufrechte Position kippt, um die Überführung der darin befindlichen Anordnungen (12) mittels der Stößelanordnung (466) in den vertikalen Strang der Endlosband-Fördereinrichtung (462) zu ermöglichen.

25. Vorrichtung nach Anspruch 24, bei welcher die Schwenkeinrichtung das Tablett (100) anschließend an die Beendigung der schrittweisen Überführung der Anordnungen (12) von dort zur Endlosband-Fördereinrichtung (462) in eine horizontale Position zurückbringt.

26. Vorrichtung nach Anspruch 18, bei welcher die Transporteinrichtung (390) eine Rollenbahnanordnung umfaßt, die zumindest teilweise angetrieben ist, um das mindestens eine Tablett (100) zu befördern.

27. Vorrichtung nach Anspruch 26, bei welcher die Rollenbahnanordnung ein Spursegment (190) zur Rückführung geleerter Tabletts (100) zu einer Startposition (200) aufweist, um die Tabletts (100) dort mit paarweisen Anordnungen von Blisterverpakkungen (12) zu füllen.

28. Vorrichtung nach einem der bisherigen Ansprüche, bei welcher eine Vielzahl von Sensoren an der Vorschubbahn des mindestens einen Tabletts (100) durch die Vorrichtung hindurch angeordnet ist, um die Funktion der dort tätigen Komponenten der Vorrichtung zu steuern.

29. Verfahren zur Sterilisation von Anordnungen (12) untereinander verbundener Blisterverpackungen, deren jede eine Kontaktlinse in einer sterilen Umgebung enthält, mit den Schritten:

a) Betätigen einer Aufnahme- und Drehanordnung (32) zur Aufnahme aufeinanderfolgender Paare der Anordnungen (12) und zum Ausrichten jedes der Paare in einer vorgegebenen Lage zueinander;

b) Betätigen einer Pendelverkehrs-Förderbaugruppe (34) mit einem Träger für eine Vielzahl der ausgerichteten Paare von Anordnungen (12) über ein Überführungselement, welches mit der Aufnahme- und Drehanordnung (32) und der Pendelverkehrs-Förderbaugruppe (34) funktionell synchron zusammenwirkt, um die Vielzahl ausgerichteter Paare von Anordnungen (12) nacheinander von der Aufnahme- und Drehanordnung (32) zum Träger auf der Pendelverkehrs-Förderbaugruppe (34) zu überführen;

c) Bewegen mindestens eines Tabletts (100) mit einer Anzahl benachbarter Reihen von Anordnungs-Aufnahmeräumen (102) zur Aufnahme jeweils eines Paares von Anordnungen (12) in jedem Aufnahmeraum (102) in eine Position in der Nähe der Pendelverkehrs-Förderbaugruppe (34);

d) Verschieben einer Stößelanordnung (52), die funktionsmäßig mit der Pendelverkehrs-Förderbaugruppe (34) verbunden ist, um eine vorgegebene Menge der Anordnungen (12)

von dem Träger in Aufnahmeräume (102) in dem mindestens einen Tablett (100) zu überführen;

e) Befördern mindestens eines mit Anordnungen gefüllten Tabletts (100) in eine Sterilisationskammer (150) zur gemeinsamen Sterilisation der Anordnungen der auf dem mindestens einen Tablett (100) gelagerten Blisterverpackungen (12) in der Kammer (150).

30. Verfahren nach Anspruch 29, bei welchem die Aufnahme- und Drehanordnung (32) eine Vakuumeinheit umfaßt, welche zum Erfassen eines Paares von Anordnungen (12) sowie zum Schwenken des Paares von Anordnungen (12) in eine Ausrichtung mit Abstand voneinander betätigt wird.

31. Verfahren nach Anspruch 30, bei welchem die Anordnungen durch pneumatisch betätigte Armelemente (76) eines an die Vakuumeinheit angeschlossenen Rohrverteilers (74) erfaßt werden, um das Paar von Anordnungen (12) in die Ausrichtung mit Abstand voneinander zu schwenken.

32. Verfahren nach Anspruch 30, bei welchem die Vakuumeinheit Saugeinrichtungen (75) aufweist, welche sich an das Paar von Anordnungen (12) während des Schwenkens in die Position der Anordnungen (12) mit Abstand voneinander greifend anlegen.

33. Verfahren nach Anspruch 29, bei welchem das Überführungselement ein Stößelelement (79) aufweist, um ein Paar der Anordnungen (12) gleitend in aufeinander folgende Räume vorzuschieben, welche zwischen einer Vielzahl sich radial nach außen erstreckender Finger (64) auf dem Anordnungsträger der Pendelverkehrs-Förderbaugruppe (50) ausgebildet sind.

34. Verfahren nach Anspruch 33, bei welchem eine Antriebseinrichtung (66) eine Endlosband-Fördereinrichtung (62) der Förderbaugruppe (50) in schrittweise Vorschubbewegungen versetzt, wobei der Träger eine Vielzahl im Abstand voneinander auf dem Umfang der Bandfördereinrichtung (62) angeordnete Finger (64) aufweist und das Stößelelement (79) nacheinander ausgerichtete Paare von Anordnungen (12) von der Aufnahme- und Drehanordnung (32) vorschiebt, um jeweils ein Paar dieser Anordnungen (12) im jeweiligen Zwischenraum zwischen benachbarten Fingern (64) der Endlosband-Fördereinrichtung (62) zu positionieren.

35. Verfahren nach Anspruch 34, bei welchem eine Gleitführung das Stößelelement in bezug auf die Aufnahme- und Drehanordnung (32) quer zur Richtung des Schrittvorschubes der Endlosband-Fördereinrichtung (62) hin und herbewegt.

36. Verfahren nach Anspruch 34, bei welchem die Endlosband-Fördereinrichtung (62) einen vertikalen Strang hat, wobei die Paare von Anordnungen (12) entlang der Ausdehnung des vertikalen Stranges in die Zwischenräume zwischen den Fingern (64) eingelegt werden, das mindestens eine Tablett (100) eine Vielzahl von Reihen nebeneinander angeordneter Aufnahmeräume (102) hat, jede der Reihen von Aufnahmeräumen (102) nacheinander zu den Abständen ausrichtbar ist, welche die Anordnungen (12) zwischen den Fingern (64) entlang des vertikalen Stranges der Endlosband-Fördereinrichtung (62) enthalten, die Stößelanordnung (52) eine Vielzahl kammförmiger Vorsprünge aufweist, welche mit der Anzahl der Zwischenräume zwischen den Fingern (64) am vertikalen Strang der Endlosband-Fördereinrichtung (62) übereinstimmend in die Zwischenräume zwischen den Fingern (64) vorschiebbar ist und die Stößelanordnung (52) zur Endlosband-Fördereinrichtung (62) hin vorgeschoben wird, um die in den Zwischenräumen zwischen den Fingern (64) befindlichen Anordnungen (12) zusammen in die dazu ausgerichteten Reihen von Aufnahmeräumen (102) auf dem mindestens einen Tablett (100) zu überführen.

37. Verfahren nach Anspruch 36, bei welchem das mindestens eine Tablett (100) schrittweise weitergeschaltet wird, um nacheinander die vertikalen Reihen der darin befindlichen Aufnahmeräume (102) jeweils nach dem Füllen der vorhergehenden Reihe solcher Aufnahmeräume (102) in dem mindestens einem Tablett (101) zu dem vertikalen Strang der Endlosband-Fördereinrichtung (62) auszurichten, und die Reihen von Aufnahmeräumen (102) in diesem Tablett (100) mit paarweisen Anordnungen (12) von Blisterverpackungen zu füllen.

38. Verfahren nach Anspruch 36, bei welchem das mindestens eine Tablett (100) während der Förderung durch die Vorrichtung hindurch normalerweise in einer horizontalen ebenen Lage gehalten wird.

39. Verfahren nach Anspruch 38, bei welchem das mindestens eine Tablett (100) an der Pendelverkehrs-Förderbaugruppe (34) in eine aufrechte Position geschwenkt wird, um die sich vertikal erstreckenden Reihen von Aufnahmeräumen (102) in dem mindestens einen Tablett (100) nacheinander zu den Zwischenräumen zwischen den Fingern (64) entlang des vertikalen Stranges der Endlosband-Fördereinrichtung (62) auszurichten und so die Überführung der Paare von Anordnungen (12) von

der Endlosband-Fördereinrichtung (62) zum Füllen des mindestens einen Tabletts (100) zu ermöglichen.

40. Verfahren nach Anspruch 39, bei welchem das mindestens eine Tablett (100) nach dem Füllen der Reihen von Aufnahmeräumen (102) in diesem mindestens einem Tablett (100) mit den Paaren von Anordnungen (12) in seine normale horizontale Position geschwenkt wird.

41. Verfahren nach Anspruch 29, bei welchem das Transportsystem entlang der Förderbahn (E) des mindestens einen Tabletts (100) zwischen der Pendelverkehrs-Förderbaugruppe (50) und der Sterilisationskammer (150) einen Stapelmechanismus (370) aufweist, um mindestens zwei der mit Anordnungen gefüllten Tabletts (100) vertikal übereinander zu stapeln.

42. Verfahren nach Anspruch 41, bei welchem das Transportsystem Rollenbahnen (380) zum Befördern der mindestens zwei gestapelten Tabletts (100) vom Stapelmechanismus (370) in die Sterilisationskammer (150) aufweist.

43. Verfahren nach Anspruch 42, bei welchem zumindest Teile der Rollenbahnen (380) in Umdrehungen versetzt werden, um die Tabletts (100) von der Pendelverkehrs-Förderbaugruppe (50) in die Sterilisationskammer (150) vorwärts zu bewegen.

44. Verfahren nach Anspruch 43, bei welchem das Transportsystem weitere Rollenbahnen (390) aufweist, die sich vom Auslaß der Tabletts (100) aus der Sterilisationskammer (150) aus erstrecken und die Verbindung zu einer Tablett-Entlade-Pendelverkehrs-Fördereinrichtung (440) herstellen, um die in dem Tablett (100) enthaltenen Anordnungen (12) zu einer Karton-Verpackungseinrichtung (488) zu überführen.

45. Verfahren nach Anspruch 29, bei welchem die Sterilisationskammer (150) aus einem Autoklaven besteht.

46. Verfahren nach einem der Ansprüche 29 bis 45, welches weiterhin Schritte zum zweiten Verpacken von Anordnungen (12) untereinander verbundener Blisterverpackungen, deren jede eine Kontaktlinse in steriler Umgebung enthält, in Kartons (22) umfaßt, wobei die weiteren Schritte sind:

a) Fördern des mindestens einen Tabletts (100) von der Sterilisationskammer (150), in welcher die Anordnungen (12) gemeinsam sterilisiert werden;

b) Betätigen einer Pendelverkehrs-Förderbaugruppe (440) zur Aufnahme der Anordnungen (12) von dem mindestens einen Tablett (100), wobei diese Pendelverkehrs-Förderbaugruppe (440) ein Endlos-Förderband (462) mit einer Vielzahl im Abstand voneinander angeordneter, nach außen gerichteter Finger (464) an seinem Außenumfang aufweist, und Fördern des mindestens einen Tabletts (100) zu der Pendelverkehrs-Förderbaugruppe (250);

c) Schwenken des mindestens einen Tabletts (100) an der Pendelverkehrs-Förderbaugruppe (440) in eine aufrechte Position, um die senkrecht angeordneten Reihen von Aufnahmeräumen (102) in dem mindestens einen Tablett (100) zu den Zwischenräumen zwischen den Fingern (464) entlang des vertikalen Stranges des Endlos-Förderbandes (462) auszurichten;

d) Ausfahren einer Stößelanordnung (466) mit einer Vielzahl im Abstand voneinander angeordneter Vorsprünge (466a) in die Aufnahmeräume (102) des mindestens einen Tabletts (100), um die Anordnungen (12) in jeder Reihe von Aufnahmeräumen (102) in die dazu ausgerichteten Zwischenräume zwischen den Fingern (464) am vertikalen Strang des Endlos-Förderbandes (462) zu überführen;

e) aufeinander folgendes Ausrichten von Kartons (22) mit offenem Ende zu einem oberen, horizontalen Strang des Endlos-Förderbandes (462) und

f) Hin- und Herbewegen eines Gleitstößels am oberen Strang des Endlos-Förderbandes (46), um nacheinander vorgegebene Anzahlen von Anordnungen (12) von dem oberen horizontalen Strang des Endlos-Förderbandes (462) in jeweils einen Karton (22) zu überführen.

47. Verfahren nach Anspruch 46, bei welchem der obere, horizontale Strang der Endlosband-Fördereinrichtung (462) mit den Kartons (22) in Verbindung steht und die Anordnungen (12) nacheinander in die jeweiligen Kartons (21) hineingleiten.

48. Verfahren nach Anspruch 46, bei welchem eine Karton-Verpackungseinrichtung (488) eine Rundschaltanordnung, in deren durchgehende Öffnungen Kartons (22) mit offenem Ende eingesetzt werden sowie eine Antriebseinrichtung zu Drehen der Rundschaltanordnung synchron zum Einsetzen der Anordnungen (12) in die Kartons (22) umfaßt.

49. Verfahren nach Anspruch 48, bei welchem die

Rundschaltanordnung Elemente zum Schließen der End-Klappdeckel der Kartons (22) im Anschluß an das Füllen der Kartons (22) mit den Anordnungen (12) sowie zum dichten Verschließen der geschlossenen Kartons (22) aufweist.

50. Verfahren nach Anspruch 49, bei welchem die mit den Anordnungen gefüllten Kartons (22) nacheinander von der Rundschalteinrichtung zu Karton-Wiege- und -Etikettierungsstationen sowie zum Sammeln der Kartons (22) zur weiteren Handhabung befördert werden.

51. Verfahren nach Anspruch 46, bei welchem eine Vielzahl gestapelter Tabletts (100) von der Sterilisationskammer (150) zur Pendelverkehrs-Förderbaugruppe (440) transportiert werden, und ein Tablett-Entstapel-Mechanismus (400) die gestapelten Tabletts (100) trennt und einzelne Tabletts (100) in vorgegebenen Vorschubabständen zur Pendelverkehrs-Förderbaugruppe (440) vorschiebt.

52. Verfahren nach Anspruch 51, bei welchem die entstapelten Tabletts (100) nacheinander in eine aufrechte Position gekippt werden, um die Überführung der darin befindlichen Anordnungen (12) in den vertikalen Strang der Endlosband-Fördereinrichtung (462) zu ermöglichen.

53. Verfahren nach Anspruch 52, bei welchem die Tabletts (100) anschließend an die Beendigung der schrittweisen Überführung der Anordnungen (12) von dort zur Endlosband-Fördereinrichtung (462) in eine normale horizontale Position zurückgebracht werden.

54. Verfahren nach Anspruch 46, bei welchem eine Rollenbahnanordnung (390) zumindest teilweise angetrieben wird, um das mindestens eine Tablett (100) zu befördern.

55. Verfahren nach Anspruch 54, bei welchem geleerte Tabletts (100) zu einer Startposition (200) befördert werden, um die Tabletts (100) dort mit paarweisen Anordnungen von Blisterverpackungen (12) zu füllen.

56. Verfahren nach einem der Ansprüche 29 bis 55, bei welchem eine Rutscheinrichtung (480) den oberen, horizontalen Strang der Endlosband-Fördereinrichtung (462) mit einer Karton-Verpackungseinrichtung (488) verbindet, damit die Anordnungen (12) auf der Rutscheinrichtung (480) entlang an deren Ausgabe-Ende nacheinander in die offenen Enden der durch die Karton-Verpackungseinrichtung (488) ausgerichteten Kartons (22) gleiten.

57. Verfahren nach einem der Ansprüche 29 bis 56, bei welchem eine Vielzahl an der Vorschubbahn des mindestens einen Tabletts (100) angeordneter Sensoren die Funktion der dort tätigen Komponenten der Vorrichtung zur Durchführung des Verfahrens steuert.

Revendications

1. Machine pour la stérilisation de plaquettes d'emballages blister groupés contenant chacun une lentille de contact dans un environnement stérile ; comprenant

(a) un dispositif de saisie et de rotation (32) destiné à recevoir des paires successives desdites plaquettes (12) et à orienter chacune desdites paires dans une relation prédéterminée l'une par rapport à l'autre ;
(b) un ensemble transporteur-navette (34) comprenant une structure de support pour une pluralité desdites paires orientées de plaquettes (12) ; un élément de transfert associé de manière fonctionnelle audit dispositif de saisie et de rotation (32) et audit ensemble transporteur-navette (34) pour transférer séquentiellement ladite pluralité de paires orientées de plaquettes (12) depuis ledit dispositif de saisie et de rotation (32) vers ladite structure de support sur ledit ensemble transporteur-navette (34) ;
(c) au moins un plateau (100) ayant une série de rangées situées de manière adjacente d'espaces de réception de plaquettes (102) destinés à loger une dite paire de plaquettes (12) respectivement dans chaque dit espace, ledit au moins un plateau (100) pouvant être placé en position à proximité dudit ensemble transporteur-navette (34) ;
(d) une structure de pousseur (52) associée de manière fonctionnelle audit ensemble transporteur-navette (34) pour transférer une quantité prédéterminée desdites plaquettes (12) depuis ladite structure de support jusque dans les espaces dans ledit au moins un plateau (100) ;
(e) une chambre de stérilisation (150) destinée à recevoir ledit au moins un plateau (100) ; et une installation de transport destinée à transporter ledit au moins un plateau (100) chargé de plaquettes vers ladite chambre de stérilisation (150), en vue de la stérilisation des plaquettes d'emballages blister (12) logées dans ledit au moins un plateau (100) dans ladite chambre (150).

2. Machine selon la revendication 1, dans laquelle ledit dispositif de saisie et de rotation (32) comprend une unité aspirante comprenant des moyens (75) pour prendre une paire desdites plaquettes

(12) ; et une structure d'actionnement pour faire pivoter ladite paire de plaquettes (12) dans une orientation d'entrelacement mutuel.

3. Machine selon la revendication 2, dans laquelle lesdits moyens de prise de plaquettes comprennent des éléments formant bras à actionnement pneumatique (76) d'un collecteur (74) connecté à ladite unité aspirante pour faire pivoter ladite paire de plaquettes (12) dans ladite orientation d'entrelacement.

4. Machine selon la revendication 2, dans laquelle ladite unité aspirante comprend des moyens d'aspiration (75) destinés à mettre en contact par préhension ladite paire de plaquettes (12) pendant le pivotement de celle-ci dans la position d'entrelacement pour lesdites plaquettes (12).

5. Machine selon la revendication 1, dans laquelle ledit élément de transfert comprend un élément pousseur (79) destiné à faire avancer de manière coulissante des paires de plaquettes (12) dans des espaces successifs formés entre chacun d'une pluralité de doigts (64) s'étendant radialement vers l'extérieur sur ladite structure de support de plaquettes de l'ensemble transporteur-navette (50).

6. Machine selon la revendication 5, dans laquelle des moyens d'entraînement (66) impriment des mouvements d'avancement intermittent à un transporteur à courroie sans fin (62) dudit ensemble transporteur (50), ladite structure de support comprenant une pluralité desdits doigts (64) espacés sur toute la périphérie dudit transporteur sans fin (62), ledit élément pousseur (79) faisant avancer séquentiellement des paires orientées desdites plaquettes (12) à partir dudit dispositif de saisie et de rotation (32) de façon à positionner une paire desdites plaquettes (12) dans chaque espace respectif entre des doigts adjacents (64) sur ledit transporteur à courroie sans fin (62).

7. Machine selon la revendication 6, dans laquelle un guide coulissant imprime audit élément pousseur un mouvement de va-et-vient par rapport audit dispositif de saisie et de rotation transversalement à la direction de l'avancement intermittent dudit transporteur à courroie sans fin (62).

8. Machine selon la revendication 6, dans laquelle ledit transporteur à courroie sans fin (62) a un parcours vertical, lesdites paires de plaquettes (12) étant chargées dans les espaces entre les doigts (64) tout le long dudit parcours vertical, ledit au moins un plateau (100) ayant une pluralité desdites rangées d'espaces (102) agencées les unes à côté des autres, chacune desdites rangées d'espaces pouvant être successivement positionnée en alignement avec les espaces contenant lesdites plaquettes (12) entre les doigts (64) le long du parcours vertical dudit transporteur à courroie sans fin (62), ladite structure de pousseur (52) ayant une pluralité de saillies en forme de peigne proportionnelle au nombre d'espaces entre les doigts (64) sur ledit parcours vertical de ladite courroie transporteuse sans fin (62) pouvant avancer dans les espaces entre lesdits doigts (64), et des moyens d'actionnement pour faire avancer ladite structure de pousseur dans ledit transporteur à courroie sans fin (62) de façon à transférer simultanément les plaquettes (12) contenues dans les espaces entre lesdits doigts (64) dans la rangée d'espaces alignée avec ceux-ci dans ledit au moins un plateau (100).

9. Machine selon la revendication 8, dans laquelle des moyens d'actionnement font avancer de façon intermittente ledit au moins un plateau (100) pour aligner successivement des rangées verticales d'espaces (102) dans celui-ci avec le parcours vertical de la courroie transporteuse sans fin (62) au terme du remplissage d'une rangée précédente desdits espaces dans ledit au moins un plateau (100) pour remplir lesdites rangées d'espaces (102) dans ledit plateau (100) avec des plaquettes appariées d'emballages blister.

10. Machine selon la revendication 8, dans laquelle ledit au moins un plateau (100) est normalement maintenu en position horizontale couchée pendant son transport à travers ladite machine.

11. Machine selon la revendication 10, dans laquelle des moyens de pivotement (360) inclinent ledit au moins un plateau (100) en position redressée au niveau dudit ensemble transporteur-navette (50) pour aligner successivement des rangées s'étendant verticalement d'espaces (102) dans ledit au moins un plateau (100) avec les espaces entre les doigts (64) sur le parcours vertical de ladite courroie transporteuse sans fin (62) pour faciliter le transfert desdites paires de plaquettes (12) depuis ladite courroie transporteuse sans fin (62) pour remplir ledit au moins un plateau (100).

12. Machine selon la revendication 11, dans laquelle lesdits moyens de pivotement (360) inclinent ledit au moins un plateau (100) en position horizontale normale après le remplissage des rangées d'espaces (102) dans ledit au moins un plateau (100) avec lesdites plaquettes appariées (12).

13. Machine selon la revendication 1, dans laquelle ladite installation de transport comprend un mécanisme d'empilement (370) sur le chemin de transport (E) dudit au moins un plateau (100) entre ledit

ensemble transporteur-navette (50) et ladite chambre de stérilisation (150) de façon à empiler au moins deux desdits plateaux (100) chargés de plaquettes en superposition verticale.

14. Machine selon la revendication 13, dans laquelle ladite installation de transport comprend des chemins de rouleaux (380) pour transporter lesdits au moins deux plateaux empilés (100) depuis ledit mécanisme d'empilement (370) jusque dans ladite chambre de stérilisation (150).

15. Machine selon la revendication 14, dans laquelle lesdits chemins de rouleaux (380) comprennent des moyens d'entraînement destinés à imprimer une rotation à au moins certaines parties des chemins de rouleaux (380) pour faire avancer lesdits plateaux (100) depuis ledit ensemble transporteur-navette (50) jusque dans ladite chambre de stérilisation (150).

16. Machine selon la revendication 15, dans laquelle ladite installation de transport comprend des chemins de rouleaux supplémentaires (390) s'étendant à partir d'une sortie de déchargement desdits plateaux (100) de ladite chambre de stérilisation (150), lesdits chemins de rouleaux supplémentaires (390) communiquant avec un transporteur-navette de déchargement de plateaux (440) pour transférer les plaquettes (12) contenues dans ledit plateau (100) vers un dispositif d'encartonnage (488).

17. Machine selon la revendication 1, dans laquelle ladite chambre de stérilisation (150) comprend un autoclave.

18. Machine selon l'une quelconque des revendications précédentes, comprenant en outre une machine d'emballage secondaire (488) pour emballer les plaquettes (12) dans des cartons (22), la machine d'emballage secondaire (488) comprenant:

(a) des moyens de transport (390) pour transporter ledit au moins un plateau (100) à partir de la chambre de stérilisation (50) dans laquelle lesdites plaquettes (12) sont stérilisées collectivement ;
(b) un ensemble transporteur-navette (440) destiné à recevoir lesdites plaquettes (12) dudit au moins un plateau (100) ; ledit ensemble transporteur-navette (440) comprenant une courroie transporteuse sans fin (462) ayant une pluralité de doigts (464) espacés s'étendant vers l'extérieur sur toute la périphérie de celle-ci, lesdits moyens de transport (390) transportant ledit au moins un plateau (100) vers ledit ensemble transporteur-navette (440) ;
(c) des moyens de pivotement (460) destinés à incliner ledit au moins un plateau dans une position redressée au niveau dudit ensemble transporteur-navette (440) pour aligner successivement des rangées orientées verticalement d'espaces (102) dans ledit au moins un plateau (100) avec les espaces entre les doigts (464) le long d'un parcours vertical de ladite courroie transporteuse sans fin ;
(d) une structure de pousseur (466) comprenant une pluralité de saillies espacées pouvant s'étendre dans les espaces (102) dudit au moins un plateau (100) pour transférer les plaquettes (12) de chaque rangée d'espaces (102) dans des espaces alignés entre les doigts (464) sur le parcours vertical de ladite courroie transporteuse sans fin (462) ;
(e) un dispositif d'encartonnage (488) comprenant des moyens de positionnement (480) pour aligner successivement des cartons ouverts (22) avec un parcours horizontal supérieur de ladite courroie transporteuse sans fin (462) ; et
(f) un pousseur coulissant destiné à produire un mouvement de va-et-vient à proximité dudit parcours supérieur du transporteur à courroie sans fin (462) pour transférer des nombres prédéterminés successifs de plaquettes (12) depuis ledit parcours horizontal supérieur de la courroie transporteuse sans fin (462) vers un carton respectif (22) dans ledit dispositif d'encartonnage (488).

19. Machine selon la revendication 18, dans laquelle des moyens formant goulotte (480) relient le parcours horizontal supérieur dudit transporteur à courroie sans fin (462) audit dispositif d'encartonnage (488), ledit pousseur coulissant faisant glisser des plaquettes successives (12) le long desdits moyens formant goulotte (480) jusque dans un carton (22) aligné par ledit dispositif d'encartonnage (488) avec une extrémité de déchargement desdits moyens formant goulotte (480).

20. Machine selon la revendication 18, dans laquelle ledit dispositif d'encartonnage (488) comprend une structure de roue à mouvement rotatif intermittent, lesdits cartons ouverts (22) pouvant être insérés dans des ouvertures traversantes dans ladite structure de roue ; et des moyens d'entraînement pour faire tourner ladite structure de roue en synchronisation avec l'insertion de plaquettes (12) dans lesdits cartons (22) par ledit pousseur coulissant.

21. Machine selon la revendication 20, dans laquelle ladite structure de roue comprend des éléments destinés à fermer des rabats d'extrémité sur lesdits cartons (22) après le remplissage desdits cartons

(22) avec lesdites plaquettes (12) et à sceller lesdits cartons fermés.

22. Machine selon la revendication 21, dans laquelle des moyens transporteurs (494) communiquent avec ledit dispositif d'encartonnage (488) pour transporter séquentiellement des cartons chargés de plaquettes (22) depuis ladite structure de roue jusqu'à des stations de pesage et d'étiquetage de cartons et pour recueillir lesdits cartons (22) en perspective d'autres manipulations.

23. Machine selon la revendication 18, dans laquelle lesdits moyens de transport (390) transportent une pluralité de plateaux empilés (100) depuis ladite chambre de stérilisation (150) jusqu'audit ensemble transporteur-navette (440) ; et un mécanisme de séparation de plateaux (400) pour séparer lesdits plateaux empilés (100) et envoyer chacun desdits plateaux (100) vers ledit ensemble transporteur-navette (440) selon un intervalle prédéterminé.

24. Machine selon la revendication 23, dans laquelle des moyens de pivotement inclinent lesdits plateaux non empilés (100) en séquence dans une position redressée pour faciliter le transfert des plaquettes (12) logées dans celui-ci vers le parcours vertical dudit transporteur à courroie sans fin (462) par ladite structure de pousseur (466).

25. Machine selon la revendication 24, dans laquelle lesdits moyens de pivotement remettent ledit plateau (100) dans une position horizontale après l'achèvement du transfert intermittent des plaquettes (12) de celui-ci vers ledit transporteur à courroie sans fin (462).

26. Machine selon la revendication 18, dans laquelle lesdits moyens de transport (390) comprennent un dispositif de chemin de rouleaux dont certaines parties au moins sont mises en rotation pour transporter ledit au moins un plateau (100).

27. Machine selon la revendication 26, dans laquelle ledit dispositif de chemin de rouleaux comprend un segment de chemin (190) pour renvoyer des plateaux vidés (100) vers un emplacement de départ initial (200) pour remplir lesdits plateaux (100) avec des plaquettes appariées d'emballages blister (12).

28. Machine selon l'une quelconque des revendications précédentes, dans laquelle une pluralité de capteurs sont positionnés le long du chemin de transport dudit au moins un plateau (100) à travers ladite machine pour contrôler le fonctionnement des composants fonctionnels de ladite machine.

29. Procédé pour la stérilisation de plaquettes (12) d'emballages blister groupés contenant chacun une lentille de contact dans un environnement stérile ; comprenant les étapes consistant à:

(a) actionner un dispositif de saisie et de rotation (32) destiné à recevoir des paires successives desdites plaquettes (12) et à orienter chacune desdites paires dans une relation prédéterminée l'une par rapport à l'autre ;
(b) actionner un ensemble transporteur-navette (34) comprenant une structure de support pour une pluralité desdites paires orientées de plaquettes (12) à travers un élément de transfert associé de manière fonctionnelle en synchronisation avec ledit dispositif de saisie et de rotation (32) et ledit ensemble transporteur-navette (34) pour transférer séquentiellement ladite pluralité de paires orientées de plaquettes (12) depuis ledit dispositif de saisie et de rotation (32) vers ladite structure de support sur ledit ensemble transporteur-navette (34) ;
(c) placer au moins un plateau (100) ayant une série de rangées situées de manière adjacente d'espaces de réception de plaquettes (102) destinés à loger une dite paire de plaquettes (12) respectivement dans chaque dit espace (102) en position à proximité dudit ensemble transporteur-navette (34) ;
(d) déplacer une structure de pousseur (52) associée de manière fonctionnelle audit ensemble transporteur-navette (34) pour transférer une quantité prédéterminée desdites plaquettes (12) depuis ladite structure de support jusque dans les espaces (102) dans ledit au moins un plateau (100) ; et
(e) transporter ledit au moins un plateau (100) chargé de plaquettes dans une chambre de stérilisation (150) en vue de la stérilisation collective des plaquettes d'emballages blister (12) logées dans ledit au moins un plateau (100) dans ladite chambre (150).

30. Procédé selon la revendication 29, dans lequel ledit dispositif de saisie et de rotation (32) comprend une unité aspirante actionnée pour prendre une paire desdites plaquettes (12) ; et pour faire pivoter ladite paire de plaquettes (12) dans une orientation d'entrelacement mutuel.

31. Procédé selon la revendication 30, dans lequel lesdites plaquettes sont prises par des éléments formant bras à actionnement pneumatique (76) d'un collecteur (74) connecté à ladite unité aspirante pour faire pivoter ladite paire de plaquettes (12) dans ladite orientation d'entrelacement.

32. Procédé selon la revendication 30, dans lequel

ladite unité aspirante comprend des moyens d'aspiration (75) destinés à mettre en contact par préhension ladite paire de plaquettes (12) pendant le pivotement de celle-ci dans la position d'entrelacement.

33. Procédé selon la revendication 29, dans lequel ledit élément de transfert comprend un élément pousseur (79) destiné à faire avancer de manière coulissante des paires de plaquettes (12) dans des espaces successifs formés entre chacun d'une pluralité de doigts (64) s'étendant radialement vers l'extérieur sur ladite structure de support de plaquettes de l'ensemble transporteur-navette (50).

34. Procédé selon la revendication 33, dans lequel des moyens d'entraînement (66) impriment des mouvements d'avancement intermittent à un transporteur à courroie sans fin (62) dudit ensemble transporteur (50), ladite structure de support comprenant une pluralité desdits doigts (64) espacés sur toute la périphérie dudit transporteur sans fin (62), ledit élément pousseur (79) faisant avancer séquentiellement des paires orientées desdites plaquettes (12) à partir dudit dispositif de saisie et de rotation (32) de façon à positionner une paire desdites plaquettes (12) dans chaque espace respectif entre des doigts adjacents (64) sur ledit transporteur à courroie sans fin (62).

35. Procédé selon la revendication 34, dans lequel un guide coulissant imprime audit élément pousseur un mouvement de va-et-vient par rapport audit dispositif de saisie et de rotation (32) transversalement à la direction de l'avancement intermittent dudit transporteur à courroie sans fin (62).

36. Procédé selon la revendication 34, dans lequel ledit transporteur à courroie sans fin (62) a un parcours vertical, lesdites paires de plaquettes (12) étant chargées dans les espaces entre les doigts (64) tout au long dudit parcours vertical, ledit au moins un plateau (100) ayant une pluralité desdites rangées d'espaces (102) agencées les unes à côté des autres, chacune desdites rangées d'espaces pouvant être successivement positionnée en alignement avec les espaces contenant lesdites plaquettes (12) entre les doigts (64) le long du parcours vertical dudit transporteur à courroie sans fin (62), ladite structure de pousseur (52) ayant une pluralité de saillies en forme de peigne proportionnelle au nombre d'espaces entre les doigts (64) sur ledit parcours vertical de ladite courroie transporteuse sans fin (62) pouvant avancer dans les espaces entre lesdits doigts (64), et pour faire avancer ladite structure de pousseur (52) dans ledit transporteur à courroie sans fin (62) de façon à transférer simultanément les plaquettes (12) contenues dans les espaces entre lesdits doigts (64) dans la rangée d'espaces (102) alignée avec ceux-ci dans ledit au moins un plateau (100).

37. Procédé selon la revendication 36, dans lequel ledit au moins un plateau (100) est avancé de façon intermittente pour aligner successivement des rangées verticales d'espaces (102) dans celui-ci avec le parcours vertical de ladite courroie transporteuse sans fin (62) au terme du remplissage d'une rangée précédente desdits espaces (102) dans ledit au moins un plateau (100) pour remplir lesdites rangées d'espaces (102) dans ledit plateau (100) avec des plaquettes appariées d'emballages blister.

38. Procédé selon la revendication 36, dans lequel ledit au moins un plateau (100) est normalement maintenu en position horizontale couchée pendant son transport à travers ladite machine.

39. Procédé selon la revendication 38, dans lequel des ledit au moins un plateau (100) est incliné en position redressée au niveau dudit ensemble transporteur-navette (50) pour aligner successivement des rangées s'étendant verticalement d'espaces (102) dans ledit au moins un plateau (100) avec les espaces entre les doigts (64) sur le parcours vertical de ladite courroie transporteuse sans fin (62) pour faciliter le transfert desdites paires de plaquettes (12) depuis ladite courroie transporteuse sans fin (62) pour remplir ledit au moins un plateau (100).

40. Procédé selon la revendication 39, dans lequel ledit au moins un plateau (100) est incliné en position horizontale normale après le remplissage des rangées d'espaces (102) dans ledit au moins un plateau (100) avec lesdites plaquettes appariées (12).

41. Procédé selon la revendication 29, dans lequel ladite installation de transport comprend un mécanisme d'empilement (370) sur le chemin de transport (E) dudit au moins un plateau (100) entre ledit ensemble transporteur-navette (50) et ladite chambre de stérilisation (150) pour empiler au moins deux desdits plateaux (100) chargés de plaquettes en superposition verticale.

42. Procédé selon la revendication 41, dans lequel ladite installation de transport comprend des chemins de rouleaux (380) pour transporter lesdits au moins deux plateaux empilés (100) depuis ledit mécanisme d'empilement (370) jusque dans ladite chambre de stérilisation (150).

43. Procédé selon la revendication 42, dans lequel une rotation est imprimée à au moins certaines parties des chemins de rouleaux (380) pour faire avancer lesdits plateaux (100) depuis ledit ensemble trans-

porteur-navette (50) jusque dans ladite chambre de stérilisation (150).

44. Procédé selon la revendication 43, dans lequel ladite installation de transport comprend des chemins de rouleaux supplémentaires (390) s'étendant à partir d'une sortie de déchargement desdits plateaux (100) de ladite chambre de stérilisation (150), lesdits chemins de rouleaux supplémentaires (390) communiquant avec un transporteur-navette de déchargement de plateaux (440) pour transférer les plaquettes (12) contenues dans ledit plateau (100) vers un dispositif d'encartonnage (488).

45. Procédé selon la revendication 29, dans lequel ladite chambre de stérilisation (150) comprend un autoclave.

46. Procédé selon l'une quelconque des revendications 29 à 45, comprenant en outre des étapes pour l'emballage secondaire dans des cartons (22) de plaquettes (12) d'emballages blister groupés contenant chacun une lentille de contact dans un environnement stérile, les étapes supplémentaires consistant à:

(a) transporter ledit au moins un plateau (100) à partir de la chambre de stérilisation (150) dans laquelle lesdites plaquettes (12) sont stérilisées collectivement ;
(b) actionner un ensemble transporteur-navette (250) destiné à recevoir lesdites plaquettes (12) dudit au moins un plateau (100) ; ledit ensemble transporteur-navette (250) comprenant une courroie transporteuse sans fin (462) ayant une pluralité de doigts (464) espacés s'étendant vers l'extérieur sur toute la périphérie de celle-ci, et transportant ledit au moins un plateau (100) vers ledit ensemble transporteur-navette (250) ;
(c) incliner ledit au moins un plateau (100) dans une position redressée au niveau dudit ensemble transporteur-navette (250) pour aligner successivement des rangées orientées verticalement d'espaces (102) dans ledit au moins un plateau (100) avec les espaces entre les doigts (464) le long d'un parcours vertical de ladite courroie transporteuse sans fin (462) ;
(d) étendre une structure de pousseur (466) comprenant une pluralité de saillies espacées dans les espaces (102) dudit au moins un plateau (100) pour transférer les plaquettes (12) de chaque rangée d'espaces (102) dans des espaces alignés entre les doigts (464) sur le parcours vertical de ladite courroie transporteuse sans fin (462) ;
(e) aligner successivement des cartons ouverts (22) avec un parcours horizontal supérieur de ladite courroie transporteuse sans fin (462) ; et
(f) imprimer à un pousseur coulissant un mouvement de va-et-vient à proximité dudit parcours supérieur du transporteur à courroie sans fin (462) pour transférer des nombres prédéterminés successifs de plaquettes (12) depuis ledit parcours horizontal supérieur de la courroie transporteuse sans fin (462) vers un carton respectif (22) desdits cartons (22).

47. Procédé selon la revendication 46, dans lequel le parcours horizontal supérieur dudit transporteur à courroie sans fin (462) communique avec lesdits cartons (22) et fait glisser des plaquettes successives (12) jusque dans des cartons respectifs (22) alignés successivement avec ceux-ci.

48. Procédé selon la revendication 46, dans lequel un dispositif d'encartonnage (488) comprenant une structure de roue à mouvement rotatif intermittent a desdits cartons ouverts (22) insérés dans des ouvertures traversantes dans une structure de roue du dispositif d'encartonnage ; et fait tourner ladite structure de roue en synchronisation avec l'insertion successive de plaquettes (12) dans lesdits cartons (22).

49. Procédé selon la revendication 48, dans lequel ladite structure de roue comprend des éléments destinés à fermer des rabats d'extrémité sur lesdits cartons (22) après le remplissage desdits cartons (22) avec lesdites plaquettes (12) et à sceller lesdits cartons fermés.

50. Procédé selon la revendication 49, dans lequel des cartons chargés de plaquettes (22) sont séquentiellement transportés depuis ladite structure de roue jusqu'à des stations de pesage et d'étiquetage de cartons et pour recueillir lesdits cartons en perspective d'autres manipulations.

51. Procédé selon la revendication 46, dans lequel une pluralité de plateaux empilés (100) sont transportés depuis ladite chambre de stérilisation (150) jusqu'audit ensemble transporteur-navette (250) ; et un mécanisme de séparation de plateaux (400) sépare lesdits plateaux empilés (100) et envoie chacun desdits plateaux (100) vers ledit ensemble transporteur-navette (250) selon un intervalle prédéterminé.

52. Procédé selon la revendication 51, dans lequel des lesdits plateaux non empilés (100) sont inclinés en séquence dans une position redressée pour faciliter le transfert des plaquettes (12) logées dans celui-ci vers le parcours vertical dudit transporteur à courroie sans fin (462).

53. Procédé selon la revendication 52, dans lequel lesdits plateaux (100) sont inclinés dans une position normalement horizontale après l'achèvement du transfert intermittent des plaquettes (12) de celui-ci vers ledit transporteur à courroie sans fin (462).

54. Procédé selon la revendication 46, dans lequel un dispositif de chemin de rouleaux a certaines parties au moins mises en rotation pour transporter ledit au moins un plateau (100).

55. Procédé selon la revendication 54, dans lequel des plateaux vidés (100) sont transportés vers un emplacement de départ initial (200) pour remplir lesdits plateaux (100) avec des plaquettes appariées d'emballages blister (12).

56. Procédé selon l'une quelconque des revendications 29 à 55, dans lequel des moyens formant goulotte (480) relient le parcours horizontal supérieur dudit transporteur à courroie sans fin (462) à un dispositif d'encartonnage (488), pour faire glisser des plaquettes successives (12) le long desdits moyens formant goulotte (480) jusque dans des cartons ouverts (22) alignés par ledit dispositif d'encartonnage (488) avec une extrémité de déchargement desdits moyens formant goulotte (480).

57. Procédé selon l'une quelconque des revendications 29 à 56, dans lequel une pluralité de capteurs positionnés le long du chemin de transport dudit au moins un plateau contrôlent le fonctionnement des composants fonctionnels d'une machine destinée à mettre en oeuvre le procédé.

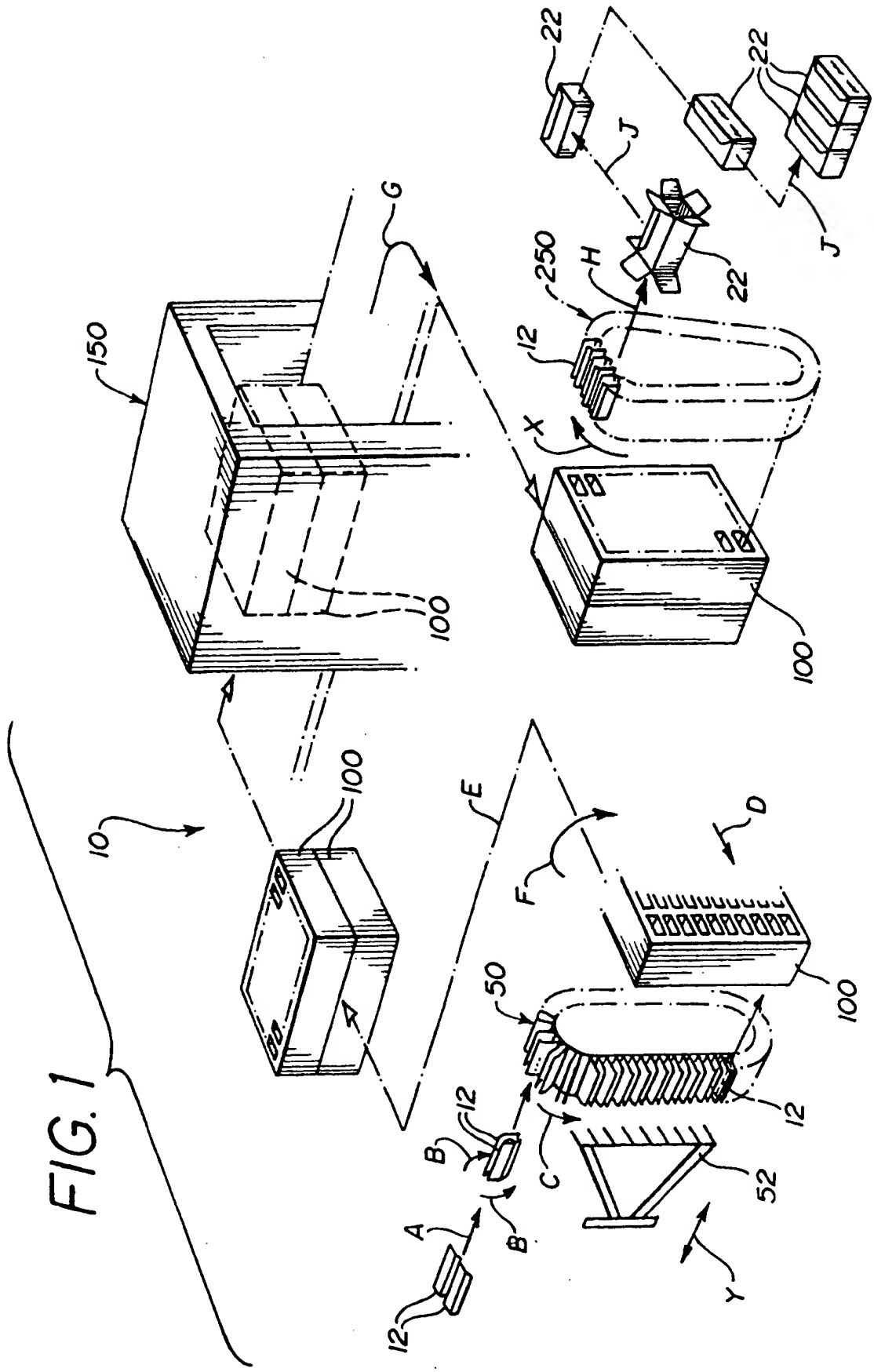


FIG. 1

FIG. 2

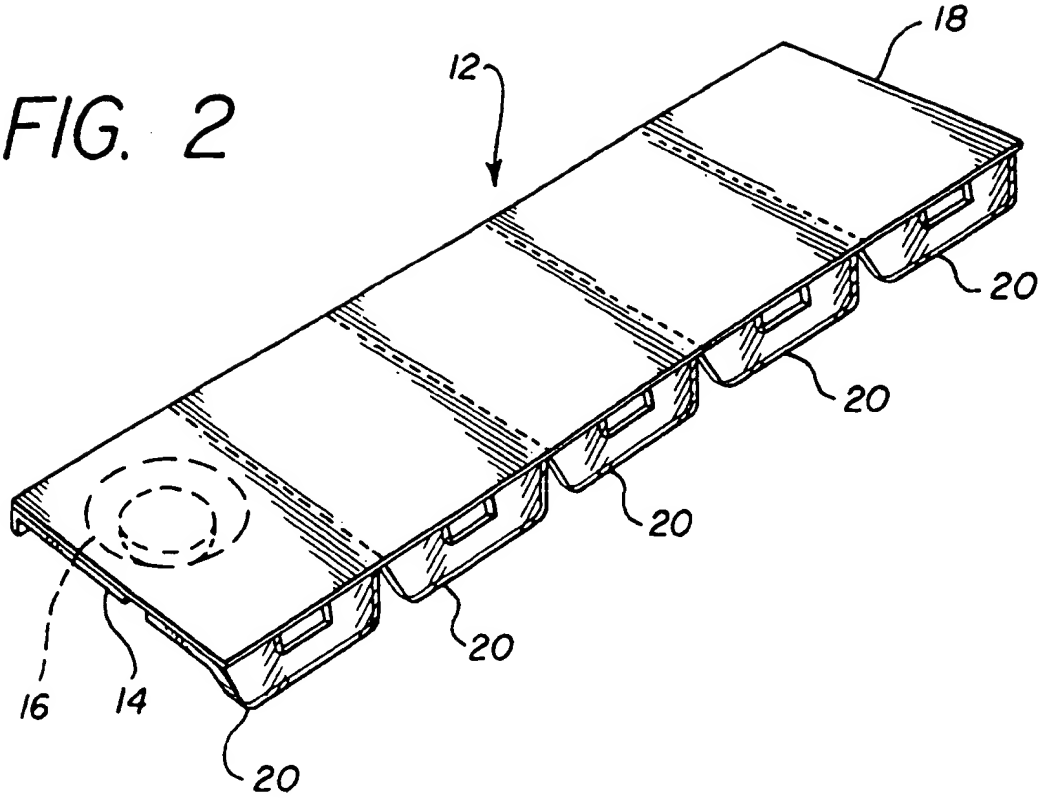


FIG. 3

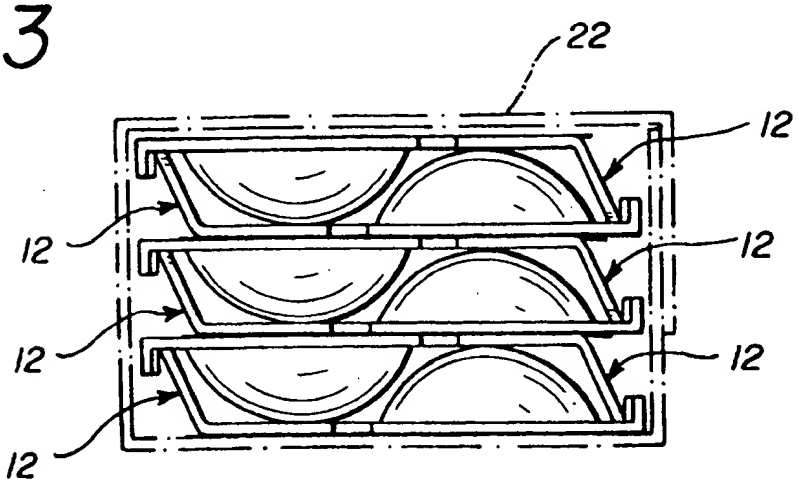


FIG. 4

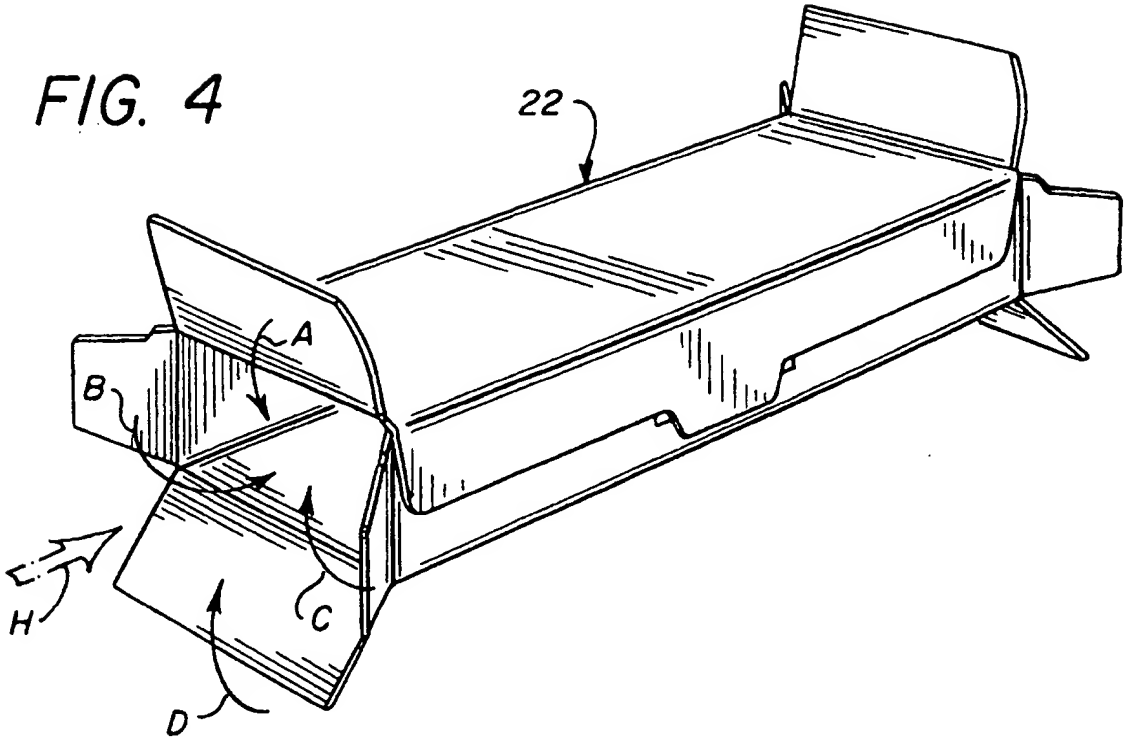
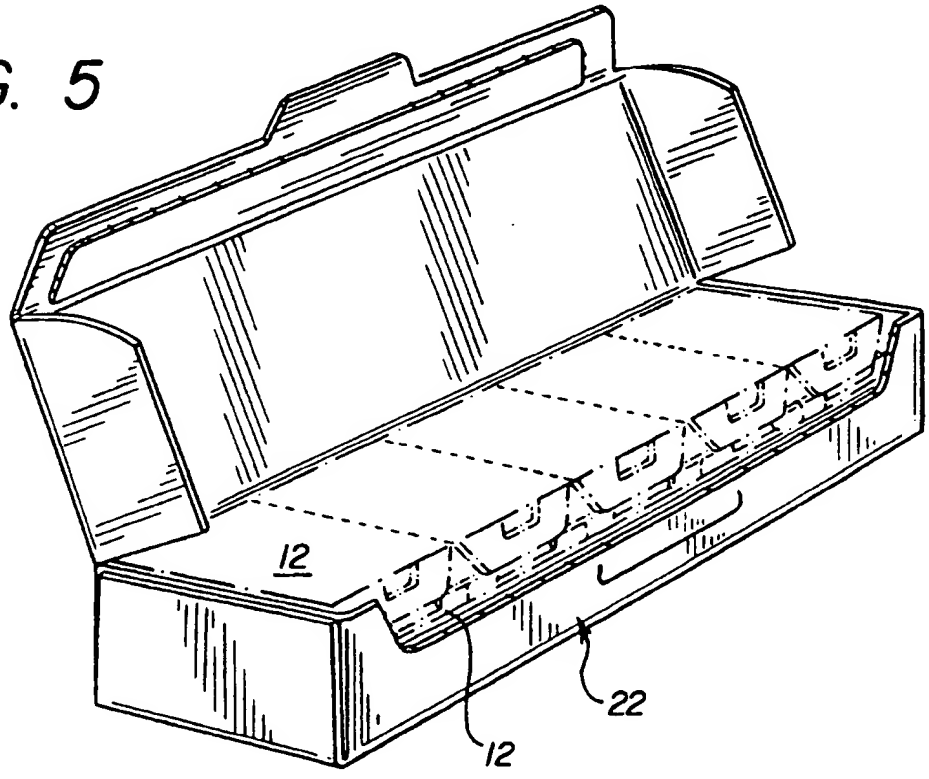


FIG. 5



PCL XL error

Subsystem: KERNEL

Error: IllegalTag

Operator: 0xbe

Position: 12086